The emergence of the Middle Palaeolithic in north-western Europe

David Herisson [a,*], Michel Brenet [b,c], Dominique Cliquet [d,e], Marie-Hel ene Moncel [a], Jürgen Richter [f], Beccy Scott [g], Ann Van Baelen [h], Kevin Di Modica [i], Dimitri De Loecker [j], Nick Ashton [g], Laurence Bourguignon [k], Anne Delagnes [l,m], Jean-Philippe Faivre [n], Milagros Folgado-Lopez [o,p], Jean-Luc Locht [q], Matt Pope [r], Jean-Paul Raynal [s], Wil Roebroeks [j], Carmen Santagata [t], Alain Turq [u], Philip Van Peer [v]

[a] Departement de Prehistoire, CNRS-UMR 7194, Museum national d'Histoire Naturelle, Institut de Paleontologie Humaine, 1 rue Rene Panhard, 75013 Paris, France [b] INRAP, 156 Avenue Jean Jaures, 33600 Pessac, France [c] CNRS, Universite Bordeaux 1, PACEA, Avenue des Facultes, 33405 Talence Cedex, France [d] Service Regional de l'Archeologie, Direction regionales des Affaires culturelles de Basse-Normandie, 13bis, rue de Saint-Ouen, 14052 Caen cedex 04, France [e] UMR CNRS 6566, Universite de Rennes 1, France

[f] Institute of Prehistoric Archaeology, University of Cologne, Weyertal 125, 50923 Koln, Germany€

[g] Department of Britain, Europe and Prehistory, British Museum, Franks House, 38-55 Orsman Road, London N1 5QJ, UK [h] LCHES, Dept. of Archaeology & Anthropology, University of Cambridge, Fitzwilliam Street, Cambridge CB2 1QH, UK

[i] Scladina Cave Archaeological Centre, Rue Fond des Vaux 339d, 5300 Sclayn-Andenne, Belgium

[j] Faculty of Archaeology, Leiden University, P.O. Box 9514, 2300 RA Leiden, The Netherlands [k] INRAP, AnTet/Arscan, Pole mixte de Recherche, Domaine de Ch^ ateau Campagne, 24260 Campagne, France^ [l] PACEA, Universite de Bordeaux, Avenue des Facultes, batiment B18, 33405 Talence cedex, France^

[m] Institute of Human Evolution, University of the Witwatersrand, Private Bag 3, Wits 2050, South Africa [n] Univ. Bordeaux/CNRS, PACEA, UMR 5199, F-33405 Talence, France [o] INRAP, Pole mixte de recherche, domaine de Campagne, 24260 Campagne, France^ [p] PACEA, UMR 5199 Universite Bordeaux 1 e CNRS, batiment B18, 33405 Talence cedex, France^

[q] INRAP Nord-Picardie, 518, rue Saint-Fuscien 80 000 Amiens, UMR CNRS 8591, France

[r] Institute of Archaeology, University College London, 31-34 Gordon Square, London WC1H OPY, UK [s] Universite Bordeaux-1 sciences et technologies, UMR 5199 PACEA, PPP, batiment B18, avenue des Facult^ es, 33405 Talence, France [t] UMR 5199 PACEA, Universite de Bordeaux 1, Batiment B18, avenue des Facult^ es, 33405 Talence, France

[u] Musee National de Prehistoire, UMR 5199 Pacea Universite de Bordeaux I, 1 Rue du Musee, Les-Eyzies-de-Tayac-Sireuil, France

[v] Prehistoric Archaeology Unit, KU Leuven, Celestijnenlaan 200e, Box 2409, 3001 Leuven, Belgium

Keywords:
Early Middle Palaeolithic
Lower Palaeolithic
Middle Palaeolithic
Acheulean
Mousterian
Technocomplex

a b s t r a c t

The nature of the LowereMiddle Palaeolithic transition has been one of the most debated questions in early Prehistory since the mid-20th century. The root of these debates lies primarily in how early prehistorians constructed chronological models, relying heavily upon index fossils. Such models have “artificial boundaries designed to provide structure to a complex record and, rather than being conceived of as permanent or real, should be frequently examined and revised (Corbey and Roebroeks, 2001)” (Monnier, 2006). In this paper, we will not focus our efforts on issues relating to nomenclature and systems of classification. Instead, we will focus on a time frame within which rapid behavioural and technological changes have been documented: the period between MIS 9 to 6.

Working on a large scale, and taking account of all of north-western Europe and its southern fringes, a group of researchers working on the main sites from this period propose an assessment of current research on the emergence of the “Middle Palaeolithic”. Using a rich corpus of archaeological sites, we discuss how humans occupied north-western Europe and its southern margins between MIS 9 to 6, focusing particularly on questions of taphonomy, conservation, chronology and environment, as well as reviewing the pattern of technological change within lithic assemblages. This overview of current research into the emergence of the Middle Palaeolithic will help to define future research paths and advance our understanding of this key period of human evolution.

* Corresponding author.
E-mail address: davidherisson@yahoo.fr (D. Herisson).

http://dx.doi.org/10.1016/j.quaint.2016.02.049

1. Introduction

“The work on understanding [the Early Middle Palaeolithic] and its significance in the evolution of archaic European hominids can begin”. These words of conclusion written by White et al. (2006) reveal that our knowledge of this period remains embryonic. However, they also emphasize that the Western European record has developed considerably these past years and now opens new research prospects. This paper is part of this double approach.

First of all, it aims to establish a critical overview of the currently available record for north-western Europe (the United Kingdom, the Netherlands, Belgium, Germany, the northern half of France) and its southern margins (the southern half of France), for a chronological period ranging from the end of the Lower Palaeolithic to the beginning of the Middle Palaeolithic, from MIS 9 to 6, or 337 to 130 ka (after Lisiecki and Raymo, 2005). Over the past decades, most researchers have come to agree that the transition between the Lower and Middle Palaeolithic marks a major change in the history of human evolution (Gamble, 1999; White and Ashton, 2003). It was first of all defined from a material point of view by a technological change involving a shift in production aims from bifaces to Levallois flakes (Bordes, 1950). This obvious material bipartition is still present in most minds, but the available archaeological data for north-western Europe and the studies undertaken up until now enable us to establish a renewed portrait of lithic technologies during the second half of the Saalian (Corbey and Roebroeks, 2001). This technological overview reveals here another side to this transition between the Lower and Middle Palaeolithic, going beyond the traditional dichotomies assert and reinforced by analytical approaches to Levallois technology, on one hand, and bifaces, on the other (Monnier, 2006).

The transition between the Lower and Middle Palaeolithic is currently perceived as a period of human history marked by profound behavioural transformations involving cognitive, social and adaptive changes (Gamble, 1999; White and Ashton, 2003), which are revealed by the lithic industries. The general representation of lithic industries will enable us, in a second phase, to bring to light spatio-temporal disparities, which will be assessed through an anthropological and behavioural approach, which is now paramount for research into this period (Monnier, 2006; Brenet, 2011; Scott, 2011; Herisson, 2012; Van Baelen, 2014).

2. Background

In order to understand how this division between the Lower and Middle Palaeolithic originated, and the impact of this historiographic legacy within discovered within them (Tuffreau et al., 1981). The chronological limits and the characteristics of the types of industries fluctuate in the works of Commont and Breuil, but significantly, Bordes established a clear division between the Acheulean and the Mousterian, marked by the Eemian Interglacial (RissWürm). Taking a techno-typological perspective, he observed that “we know no pure in situ Levallois site in a clearly Rissian or PreRissian layer” (Bordes, 1950). “Typologically, the main division between the Lower and Middle Palaeolithic is the presence or absence of bifaces. Technically, it is the presence of facets [...] and the Levallois or non-Levallois debitage of these flakes...” (Bordes, 1950).

The chrono-cultural framework defined by Bordes in the 1950s was progressively eroded by a series of sites discovered in the 1970s and 1980s, and the development of the first radiometric dating methods for the Pleistocene (Ronened.,1982). The simple equations that Lower Palaeolithic ¼ Acheulean ¼ biface industries without Levallois flakes without butt faceting ¼ Riss or pre-Riss and Middle Palaeolithic ¼ Mousterian ¼ industries without bifaces with Levallois flakes with butt faceting ¼ Riss-Würm and Würm were shown to be obsolete. A new interpretative framework was constructed for these assemblages, based initially on typo-technology, and then on lithic technology for the material culture, whilst the development of thermoluminescence dating tightened chronological control. In 1976, at Biache-Saint-Vaast, lithic industries with numerous Levallois flakes and lacking bifaces were discovered. These dated from before the Last Interglacial, and were technologically and typologically similar to certain Mousterian industries from the Last Glacial period, raising the question of their links with the Acheulean, as well as how the Middle Palaeolithic began (Tuffreau et al.,1981, p. 296). The new data from Biache-Saint-Vaast further undermined the Eemian partition, which definitively crumbled after the discovery of sites attributed to the Mousterian and correlated to the Saalian (Maastricht-Belved ere: Roebroeks, 1982, 1988; lower level of Rheindahlen: Bosinski, 1976) or to the Riss (Grotte Vauffrey: Rigaud dir., 1988). At the beginning of the 1980s, this important “chronological overhaul” (Jaubert, 1999, p. 40) opened the way to new interpretations of ante-Weichselian industries, leading Tuffreau to redefine the initial stages of the Middle

current debates focused on the transition between these two periods, we must first briefly review over one hundred and fifty years of prehistoric studies.

From the beginning of the 19th century onwards, multiple discoveries of lithic artefacts were made in brick quarries in the north of France, the United Kingdom and Belgium. Members of scholarly societies and academic institutions rapidly proved the anthropogenic status of these artefacts. After heated debates, the notion of the “very early antiquity of Man” gained ground throughout the 19th century among the scientific community. The evidence for the age of these lithic industries was based on geological work on stratigraphy and fluvial deposits on one hand, and on typologies of lithic artefacts on the other. This double approach was the key to the success of the pioneering prehistorians who demonstrated the “Antiquity of Man”; including Laurent Traulle, Casimir Picard and Jacques Boucher Crevecoeur de Perthes in France, Joseph Prestwich, John Evans and Charles Lyell in England, as well as Philippe-Charles Schmerling and Edouard Dupont (Hurel and Coye dir., 2011). In 1872, following the work of Thomsen (1836), Gabriel de Mortillet proposed a relative chronology, defining periods based on “the easiest to discern and the most precise” lithic industry (De Mortillet, 1873, 1883). This marked the beginning of the division of the Palaeolithic where the two oldest periods (the Chellean and Acheulean) were followed by the Mousterian period (see Monnier, 2006 and Hurel and Coye dir., 2011, for further details).

At the end of the 19th century and the beginning of the 20th century, research was directed towards tethering this loose chronology of cultures to specific geological eras. The fluvial terraces of the large sedimentary basins of northwest Europe were fundamental to constructing a chrono-climatic framework for Palaeolithic lithic industries. In northern France, for example, the work of Henri Breuil, Victor Commont, Franck Bourdier and François Bordes led to successive interpretative models, aiming to correlate the terraces with known Glacial-Interglacial cycles, and by extension to date the industries

Paleolithic in northern France (Tuffreau, 1979, p. 140). This first classification of the Saalian industries was mainly based on the presence or absence of bifaces and the relative proportion of the latter in the assemblage. Three groups of industries were differentiated: “Upper Acheulean with frequent bifaces, Upper Acheulean with rare bifaces or Epi-Acheulean and ante-Weichselian industries with no bifaces” (Tuffreau, 1979, p. 141). Multiple Saalian industry denominations were used throughout the 1980s and 1990s for the north of France: Epi-Acheulean with a tendency towards blade production (Tuffreau et al., 1981), Ferrassie-type Mousterian, Biache facies (Tuffreau, 1986), evolved non-Levallois Acheulean (Marcy, 1989), Cambresian facies of the Middle Palaeolithic (Tuffreau et al., 1989), Mousterian of Levalloisian facies (Ameloot-Van-der-Heijden, 1991), etc. These qualifying terms show that researchers' perceptions of these Saalian industries were changing. The evolved Acheulean status given to these industries twenty years earlier was progressively discarded. Only the bifaces perceived as reminiscent of the Acheulean point towards the existence of a link between Lower Palaeolithic assemblages and those now classified as belonging to the early phase of the Middle Palaeolithic.

From 1980 to today, the debate on the Lower to Middle Palaeolithic transition has transcended the boundaries of north-western Europe and extended into new fields of research, namely Spain, Italy, Central Europe or the Middle East (e.g. Ronened., 1982; Picin et al., 2013; Adler et al., 2014; Wisniewski, 2014; Santonja et al., 2015). The discoveries of new sites have multiplied, and considerable efforts to date occupations have been made alongside the development of new radiometric methods (e.g. ESR, U/Th, TT-OSL). The enriched corpus of well-recorded sites and an increasingly firm chronological framework for the period between 337 and 130 ka, has led to renewed interest for this period over the past decade. This momentum is reflected by a series of PhD theses focusing on sites attributed to the Early

Middle Palaeolithic in northwestern Europe: Moncel (1989, 1999) for Orgnac 3; Soriano (2001) for Mesvin IV, La Cotte de Saint Brelade and Gouzeaucourt; Scott (2006) for a series of English sites; Djema (2008) on an overview of sites in Aquitaine and the Cantabrian coast; Ashton (2010) for a summary of the sites in Great Britain; Brenet (2011) for Cantalouette 1, Combe Brune 2 and 3; Herisson (2012) for Biache-Saint-Vaast and Therdonne; Van Baelen (2014) for Kesselt-Op de Schans.

As shown by this brief historiographical review, the present-day chrono-cultural framework was established by cycles of construction and deconstruction of established models. Rather than directly testing the validity of the current division between the Lower and Middle Palaeolithic, we propose in this paper to comprehensively present the available data for a chronological period assimilated to the end of the Lower Palaeolithic and the beginning of the Middle Palaeolithic in north-western Europe and its southern margins, i.e.
the period between MIS 9 to 6, from 337 to 130 ka.

3. Material and methods

The geographical area investigated here includes north-western Europe (United Kingdom, the Netherlands, Belgium, Germany, the northern half of France) and its southern margins (southern half of France) (Fig.1). For convenience, the geographic breakdown follows the borders of the countries in question. Only France was divided into four geographical sectors due to the large amount of records present in this area. This subdivision follows the traditional intervention zones of research teams and the present-day regional administrative limits: the northwest (from the tip of the Armorican Massif to the first plains of the Parisian Basin), northeast (from the Parisian Basin to Alsace), southwest (from the Aquitaine Basin to the western boundaries of the Massif Central) and the southeast (from the Massif Central to the Alps) (Fig. 1). For each of the eight geographic entities defined in this way, all of the sites in stratigraphic context correlated to isotopic stages 9 to 6 (337e130 ka, after Lisiecki and Raymo, 2005) were examined.

A geodatabase was completed by referent researchers for each region using published and unpublished data from the 123 recorded sites and 236 archaeological layers. The coordinates from the sites were defined using the WGS84 international projection system in connection with scale analysis. For each occupation or archaeological level, a series of criteria was defined in order to characterize the dataset as consistently as possible.

The occupation context can be primary (in situ remains in the sedimentary deposits that initially covered them) or secondary (reworked remains in deposits that did not initially cover them). The spatial integrity of the remains is explained: preserved spatial integrity (no or very little post-depositional disturbance) or nonpreserved spatial integrity (post-depositional phenomena resulting in considerable redistribution of the remains).

For the chronological setting of the occupations, we chose to use the smallest common denominator to correlate all of the sites in north-western Europe and its southern fringes; the marine isotopic stages. The chronology of the sites and the different occupations was established using LR04 stack(Lisiecki and Raymo, 2005) in order to obtain a unified chronological framework, informative of broad climatic tendencies. The marine isotopic stages are not used to signify the climatic and environmental conditions in which the occupations took place. We will not revisit the discrepancy between marine and continental records, and varying responses in different environments extending between 42 and 55 latitude. The attribution of a specific occupation level to a particular isotopic stage was classified as based on direct radiometric dates on archaeological remains (TL on heated flint, ESR on teeth, U/Th on bone, etc.), on radiometric dates on sediments or concretions (IRSL, tephras, etc.), or on methods of relative chronology (lithostratigraphy, biostratigraphy, terrace system, raised beach, etc.).

It is essential to recall that certain systems, such as lœssic sequences or terrace systems, are conducive to establishing the chronological background. In some cases, such sequences can be accurately correlated with the isotopic curve and provide a resolution that is in some instances even higher than those obtained by radiometric dating techniques. The highest accuracy is reached for occupation levels in primary position that are preserved in long sedimentary sequences and where different independent proxies are available for relative, indirect and direct dating. Taking these elements into account, each occupation is assigned to an isotopic stage or, when possible, substage (question marks are used in case of uncertainties). The accuracy of each correlation is assessed and expressed as a score between 0 and 5, ranging from (0) no correlation, and (1) correlation uncertain, very scant proof, over (2) correlation uncertain, some proof and (3) good correlation but lack of convergent proof, to (4) precise and convergent correlation and (5) perfect, precise and convergent correlation. This score allows unreliable chronological correlations (0e2) to be excluded from the interpretation.

In addition to the archaeological remains, the presence or absence of faunal and anthropological remains is also indicated per record. Likewise, for each record entered in the database, the presence or absence of the following production systems was registered: Levallois (Boeda and Pelegrin,1983; Bo€ eda,1986,1988a;€ Van Peer, 1992; Boeda, 1993, 1994; Dibble and Bar-Yosef, 1995;€ Boeda, 1997€), blade production (not elongated flake production, only blades removed from volumetric blade cores; Boeda, 1988b;€ Otte et al., 1990; Revillion, 1994; Bo eda, 1997€), Discoid (Boeda,€ 1993; Locht and Swinnen, 1994; Boeda, 1997; Peresani, 1998,€ 2003; Locht, 2004), Migrating platform core reduction (MPCR)/ “Systeme par Surface de d ebitage Altern e” (SSDA), formerly named “Clactonian” flaking (Ashton et al.,1992,1994; Forestier,1993; Boeda,€ 1997; White, 2000), Quina (Turq,1988; Bourguignon,1997), Prepared Core Technology (White et al., 2011), others (weakly predetermined flaking method). The presence or absence of each of these production systems for each occupation is based on the latest published technological study of the site (cited in the references). Different definitions and realities are thus concealed (for instance in the Levallois or Discoid denominations), depending on the authors and the assemblages. We will return to this crucial topic in the discussion. For each record, the presence or absence of four types of shaped tools is furthermore recorded: pebble tools, bifaces (Boeda et al., 1996€) referred to as “Acheulean”, bifaces referred to as “Mousterian” and trifaces. Note that the trifaces were recently defined as mixed matrices resulting from a combination of flaking and shaping (Boeda,€ 1990, 1991, 1997; Garreau, 2000; Chevrier, 2006). Finally, the main raw material of each assemblage was recorded.

4. Results: MIS 9 to 6 regional overview

An overview of the current knowledge of human occupations correlated from MIS 9 to 6 (337e130 ka) for each of the eight geographical entities is presented below. These regional synopses aim to contextualize the data presented in the summarized tables and to assess which past and present research dynamics affected the site corpus. They also try to address the potential and the interpretative limits of each regional dataset within the wider debate on the emergence of the Middle Palaeolithic in Western Europe.

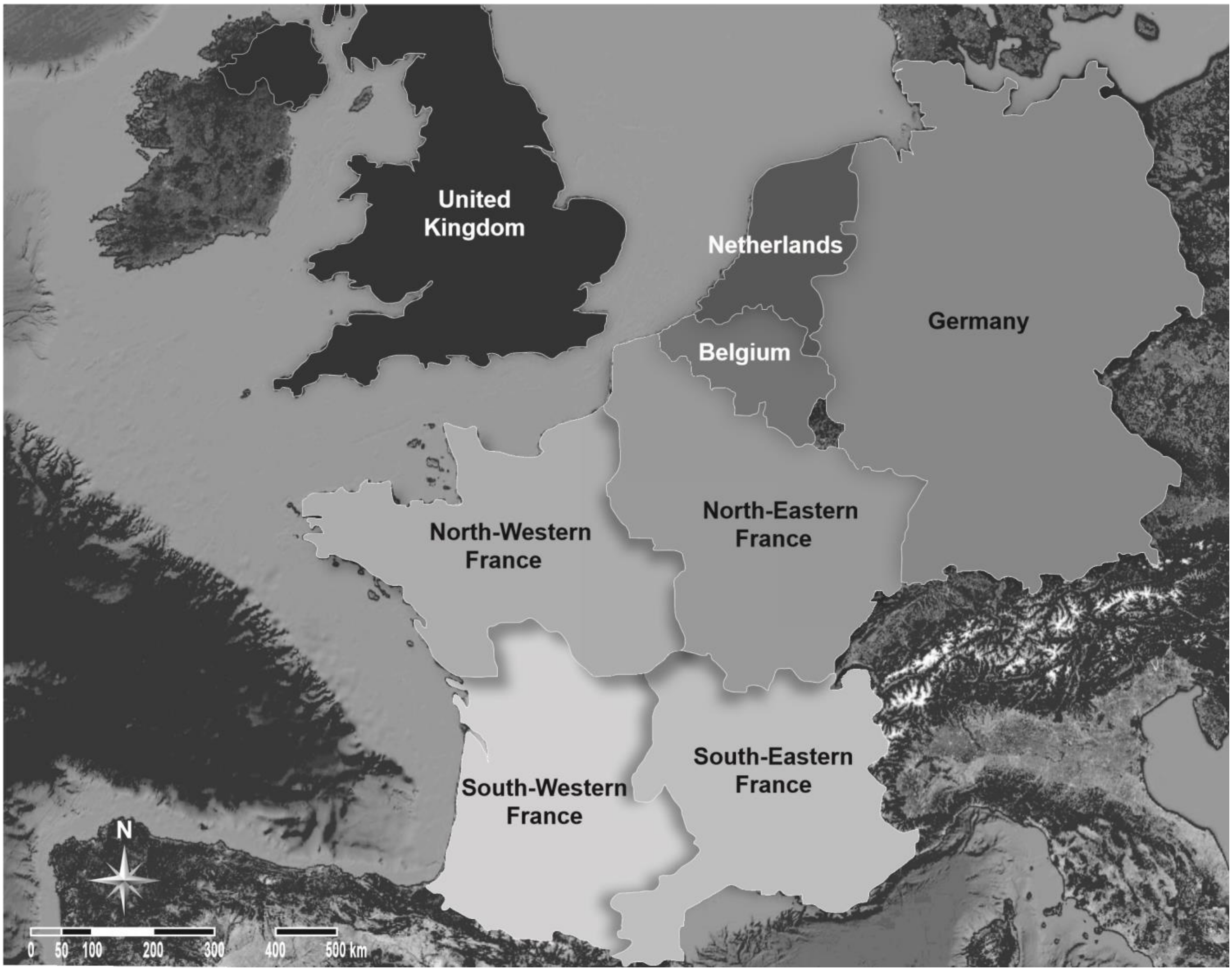

Fig.1. Geographic entities studied in Western Europe: United-Kingdom, Netherlands, Belgium, Germany and France. France has been divided in four geographic sectors: North-west (from the Massif Armoricain point to the first Bassin-Parisien plains), North-east (from the Bassin-Parisien to the Alsace plain), South-west (from Bassin Aquitain to occiendtal margins of the Massif Central) and South-East (from the Massif Central to the Alps). Background map: image Landsat, courtesy of the U.S. Geological Survey.

In order to facilitate comparisons, all the regional overviews are based on the following framework: number of sites, number of occupations (archaeological layers/levels), site context (open-air, rock shelter, cave, coastal beach ...), resolution of the chronostratigraphic framework (>an isotopic stage, ¼ 1 isotopic stage, isotopic sub-stage), construction of a chronostratigraphic framework (lithostratigraphy, radiometric dates, biostratigraphy, terrace system, coastal beaches...), presence or absence of human remains, degree of preservation of the sites (primary/secondary position, spatial integrity, presence/absence of fauna, wood, seeds, pollen, insect...), reconstruction level of the palaeoenvironmental and regional palaeogeographic framework, state of regional research (early or recent discoveries or both, new data, ongoing research programmes), reference sites for the region, old or recent regional summaries, contribution of the region to the debate on the beginnings of the Middle Palaeolithic.

4.1. United Kingdom

Eighteen British sites are currently attributed to MIS 9-6 (containing 33 archaeological layers; Table 1), nine of which are from the Thames deposits (Fig. 2). Further sites are also known from less intensively researched fluvial systems (i.e. Solent: Davis, 2014; Hatch, 2014), but they lack precise dating. The lower reaches of the Thames are widely accepted as reflecting four post-Anglian interglacials (Bridgland, 1994, 2001, 2006; Preece, 1995; Keen, 2001), and have attracted researchers since the mid-19th century. The firm chronostratigraphic record for the Thames underpins our understanding of the British early Middle Palaeolithic (EMP). Recently, the subdivision of British MIS 7 sites into early and late phases has been proposed, based on the Aveley faunal sequence (Schreve, 2001a,b), potentially corroborated by amino acid ratios on associated Bithynia opercula (Penkman et al., 2011). The stratigraphic position of most Thames sites suggests an early Interglacial (Late MIS 8 or early 7) date. However, independent correlation of these subdivisions within MIS 7 is necessary.

Most British sites occur in open-air contexts, the largest sites being associated with raw material sources (eg. Crayford: Spurrell, 1880a,b; Scott, 2011; Baker's Hole: Smith, 1911; Wenban-Smith, 1996; Scott, 2010); but there are also some occurrences further away from flint outcrops (e.g. Stoke Tunnel: Layard, 1920; Scott, 2011). Fluvial capture points aside, probable sites rich in Levallois remain undated: notably, Caddington South Site (near Luton in Bedfordshire: Bradley and Sampson, 1978) and Finglesham, East Kent (Parfitt and Halliwell 1996). OSL dating is often the only available dating method, and remains problematic in isolation. The apparent “fluvial bias” of the British record may thus be taphonomic, reflecting capture and preservation e and a lack of loess. Only two EMP cave sites are known: Pontnewydd, Elwy Valley (Aldhouse-Green et al., 2012) and La Cotte de St. Brelade (Jersey), a coastal fissure system (Callow and Cornford, 1986; Scott et al., 2014). The former has produced the only early Neanderthal remains from Britain (Compton and Stringer, 2012). North Sea and underwater palaeovalley deposits could also represent potential context for future Saalian sites discovery in UK as the prospection of Area 240 showed recently, about 11 km off the cast of Norfolk and from a depth of 25 m (Tizzard et al., 2014).

Most of the British sites are primary context sites, although they are generally fluvially rearranged, and only one (Crayford) was in situ (Spurrell, 1880a,b). Most are rich in mammalian faunal remains and molluscs, although direct evidence for vegetation (pollen and plant macros) is less common, leading to the partial reconstruction

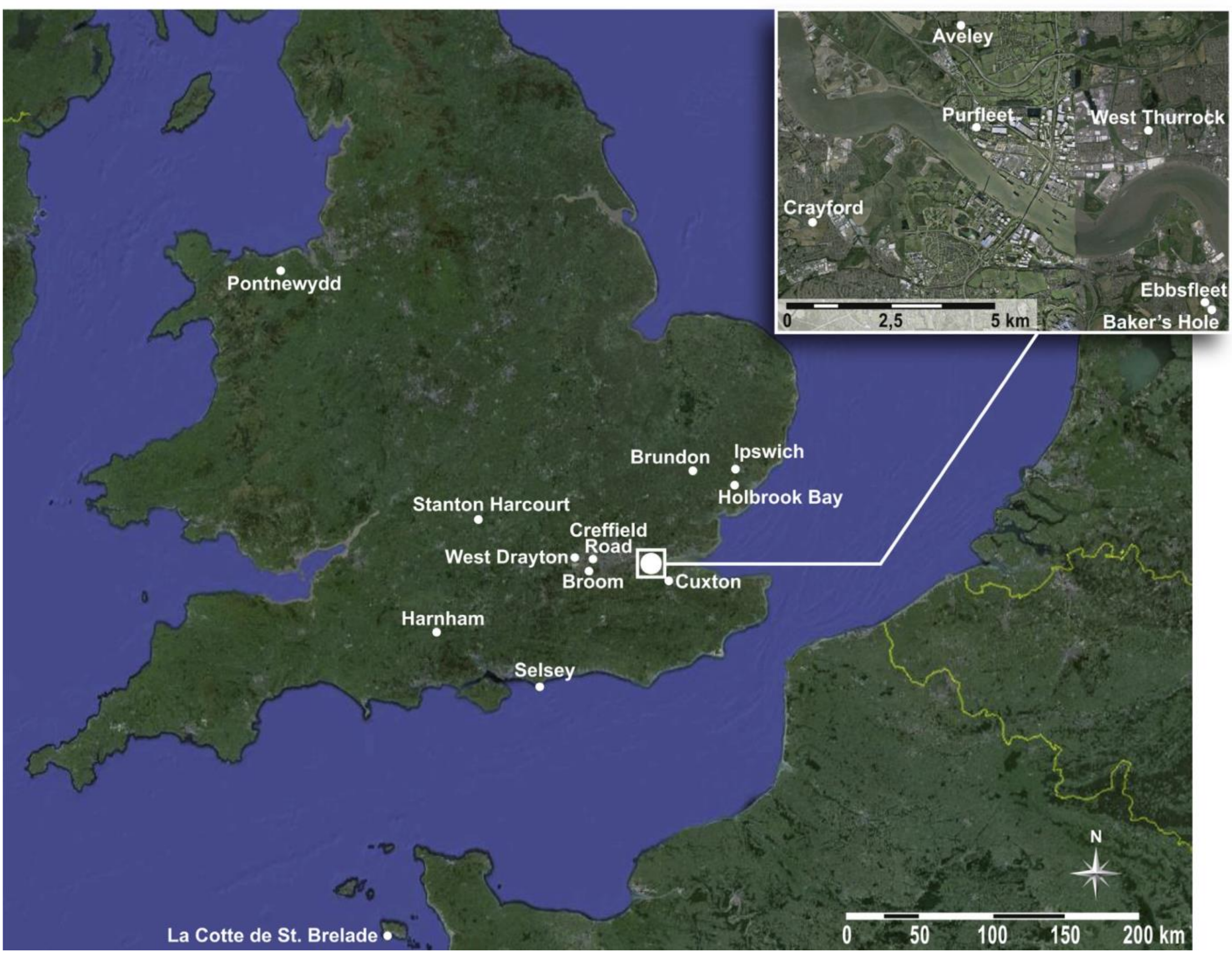

Fig. 2. Distribution map of British sites from MIS 9 to 6, referenced in Table 1. Background map: image Landsat, courtesy of the U.S. Geological Survey.

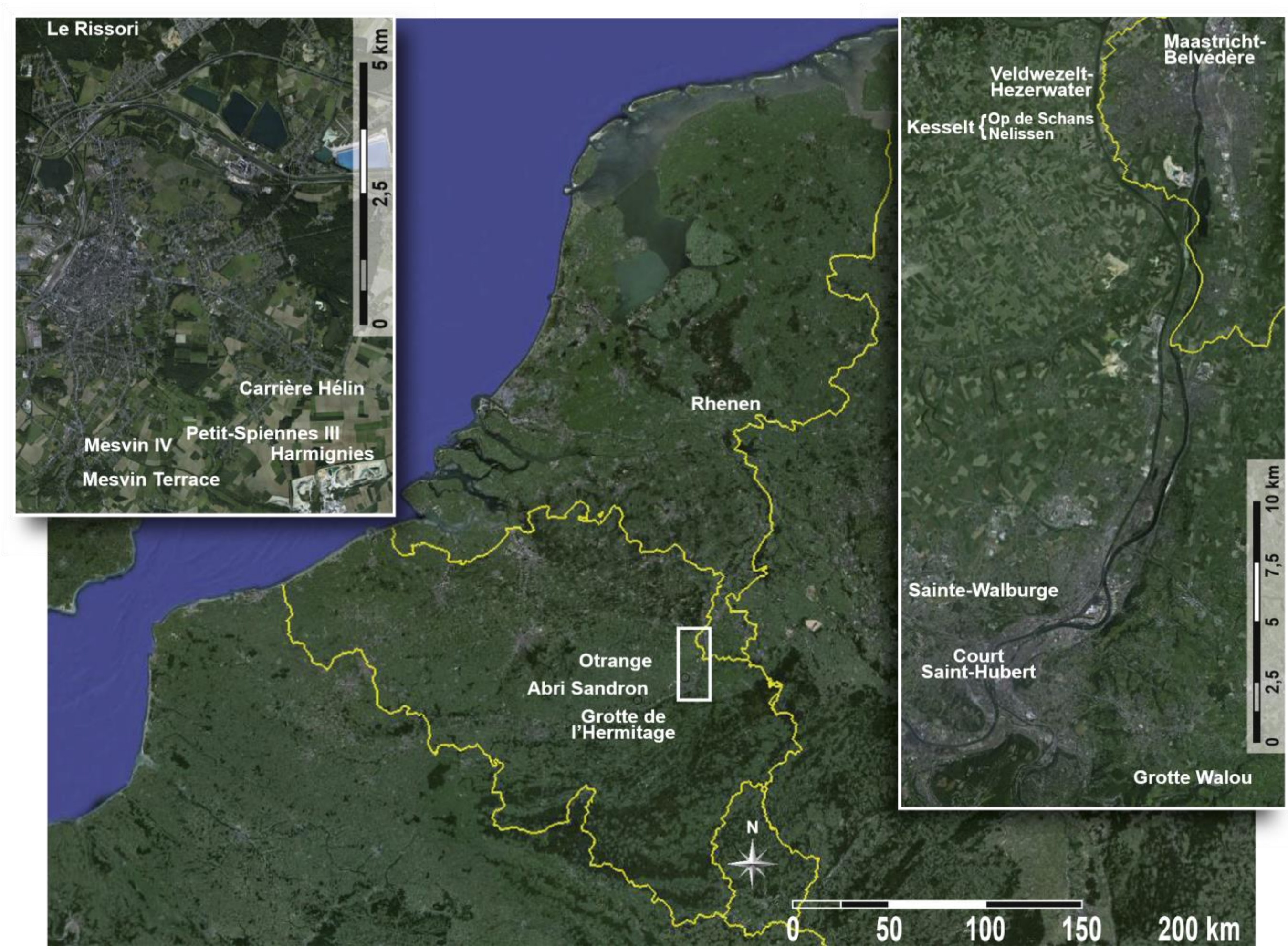

Fig. 3. Distribution map of sites of the Netherlands and Belgium from MIS 9 to 6, referenced in Tables 2 and 3. Background map: image Landsat, courtesy of the U.S. Geological Survey.

of the environment, characterized by cool, open conditions, and few trees. Reconstructing the broader palaeogeography is complicated by difficulties in correlating these phases to MIS sub-stages (and thus to global sea level) and reconstructing the channel breach. Catastrophic flooding during MIS 12 was amplified by ongoing erosion in the southern North Sea, with a second flood event suggested for MIS 6 (Busschers et al., 2007; Gibbard, 2007; Gupta et al., 2007). Combined with the progressive sinking of the North Sea plain (Busschers et al., 2008), this resulted in Britain becoming “less accessible” throughout the early Middle Palaeolithic (Ashton et al., 2011). Consequently, there are few well-dated British late MIS 7 sites (Ashton et al., 2003; Scott and Ashton, 2011).

Most sites were discovered before mechanised gravel extraction and are now built over; few have been excavated recently, apart from Lion Pit Tramway Cutting (Schreve et al., 2006), Cuxton (Wenban-Smith, 2004), Harnham (Bates et al., 2014) and Pontnewydd (Aldhouse-Green et al., 2012). A regional overview of the entire British Middle Palaeolithic predated the current chronostratigraphic framework (Coulson, 1990) and recent research (AHOB/Pathways to Britain) has concentrated on old collections (cf. Scott, 2011) and redating accessible sites (e.g. Crayford).

The site of Purfleet has led to debate concerning the beginning of the Middle Palaeolithic. At this site, the upper part (Botany Member) of gravels correlated with the Lynch Hill/Corbets Tey formation of the Thames (MIS 10-9-8) yielded simple prepared cores (where a surface has been exploited from a minimally prepared platform) and some Levallois cores (White and Ashton, 2003). These date to MIS 9/8 (terrace stratigraphy, OSL), and the archaeology is said to demonstrate one of the ways in which the principles underlying Levallois flaking were already immanent in the Acheulean prior to the widespread adoption of classic Levallois flaking after the MIS 8 Pleniglacial (White and Ashton, 2003; White et al., 2011). Handaxe manufacture persists alongside Levallois flaking into MIS 7 at Pontnewydd (where fine-grained raw materials were rare), potentially at Cuxton (although the excavators are reinvestigating the OSL dates: Bates et al., 2014) and during MIS 8 at Broom (secondary context) and Harnham (Bates et al., 2014). With the exception of Cuxton, these sites are concentrated in the west of Britain, contrasting with the Thames pattern, potentially reflecting raw material effects or the repertoires of different groups, maybe at different times (Fig. 2).

4.2. The Netherlands

In the Netherlands only one well-preserved site complex is known from the Saalian period. The Belved ere locale is situated on the northern edge of the Northwest European loess-belt and is located near of the Dutch town of Maastricht (province of Limburg; Fig. 3). “The multidisciplinary research at the Maastricht-Belved ere quarry between 1980 and 1990 remains the flagship of Middle

Table 1
Data of British sites from MIS 9 to 6, mapped in Fig. 2. Sites with a secure MIS correlation (index 3, 4 and 5; cf. Section 3) are in bold, sites with an uncertain MIS correlation (index 0, 1 and 2; cf. Section 3) are in italics.

Site	Precise location	Level/Layer	MIS	Precise MIS	Value of MIS correlation (x/5)	Direct dating	Indirect dating	Relative chronology	Context	Spatial integrity	Human remains	Faunal remains	Levallois	Pebble tools	"Acheulean" biface	"Mousterian" biface	Trifacial shaping	Blade	Discoid	MPCR/ SSDA	Quina	PCT	Others	Main raw material	Bibliography
Purfleet	Botany Pit	Botany Gravel	9/8	Early 8?	4	e	AAR: MIS 9 (Penkman et al., 2007); OSL: 154 ± 19 ka; 323 ± 23 ka; 292 ± 43 ka; 405 ± 27 ka; 360 ± 62 ka; 267 ± 38ka (Bridgland et al., 2013)	Terrace stratigraphy, mammalian biostratigraphy	Secondary	No	A	P	P	A	P?	A	A	A	P	P	A	P	A	Flint	Bridgland, 1994; Schreve et al., 2002; White and Ashton, 2003; Scott, 2011; Bridgland et al., 2013
Harnham	Harnham	Phase I	8	?	4	e	e	Lithostratigraphy	Secondary	No	A	A	A	A	P	A	A	A	A	?	?	?	?	Flint	Bates et al., 2014
Harnham	Harnham	Phase III	8	Late 8?	4	e	e	Lithostratigraphy	Primary	Yes	A	A	A	A	A	A	A	A	A	?	?	?	?	Flint	Bates et al., 2014
Harnham	Harnham	Phase III	8	Late 8?	4	e	OSL: OxL-1341: 248 ± 19 ka OxL-1342: 255 ± 20 ka; AAR ¼ Late 8/early 7 (Bates et al., 2014). DMK values fall within range of MIS 7	Mammalian biostratigraphy, lithostratigraphy	Primary	Yes	A	P	A	A	P	A	A	A	A	?	?	?	?	Flint	Bates et al., 2014
Harnham	Harnham	Phase IV	8?	Late 8?	3	e	e	Lithostratigraphy	Primary	Yes	A	A	A	A	P	A	A	A	A	?	?	?	?	Flint	Bates et al., 2014
Northfleet	Baker's Hole	Coombe Rock	8	Late 8	4	e	AAR: Late 8/early 7 (Wenban-Smith, 1995)	Terrace stratigraphy, mammalian biostratigraphy	Secondary	No	A	P	P	A	P	A	A	A	A	P	A	P	A	Flint	Smith 1911; Wenban-Smith, 1995; Scott, 2010, 2011
West Thurrock	Lion Pit Tramway Cutting	Bed 1	8/7	Late 8/ early 7	4	e	AAR: MIS 7 (Penkman et al., 2007)	Terrace system, mammalian biostratigraphy	Primary	No	A	P	P	A	A	A	A	A	A	P	A	P	A	Flint	Schreve et al., 2006; Penkman et al., 2007; Scott, 2011
West Drayton/ Yiewsley			8/ 7?	Late 8/ early 7?	3	e	e	Terrace system	Primary	No	A	A	P	A	A	A	A	A	A	A	A	A	A	Flint	Collins et al., 1978; Ashton et al., 2003; Scott, 2011
Aveley	Sandy Lane/ Purfleet Road	Bed 2	7	Early 7	4	e	AAR: MIS 7 (Penkman et al., 2007)	Terrace stratigraphy, mammalian biostratigraphy	?	No	A	P	A	A	A	A	A	A	A	A	A	A	A	Flint	Schreve, 2001b; White et al., 2006; Penkman et al., 2007
Ebbsfleet	Ebbsfleet Channel	Lower fluvial (Phase 2) deposits	7	Early 7	4	e	e	Terrace stratigraphy, mammalian and molluscan biostratigraphy	Secondary	No	A	P	P	A	A	A	A	A	A	P	P	P	A	Flint	Burchell, 1933, 1935, 1936; Kerney and Sieveking, 1977; Wenban-Smith, 1995; Scott et al., 2010
Pontnewydd		Lower Breccia	7	Early 7	4	TL: 200 ± 25 ka 269 ± 37 ka (Aldhouse-Green et al., 2012)	U/Th e speleothem underlying: 215 ± 36 ka (Schwarz in Green ed., 1984, 91e92); 224 þ 41/31 ka (Ivanovitch et al. in Green ed., 1984)	Mammalian biostratigraphy	Secondary	No	P	P	P	A	P	A	A	A	P	P	A	P	A	Igneous, coarse	Green ed., 1984; Aldhouse-Green et al., 2012
Crayford	Stoneham's Pit	Lower Brickearth	7	e	3	e	e	Terrace stratigraphy, mammalian biostratigraghy	Primary	Yes	A	P	P	A	A	A	A	A	P	P	A	A	A	Flint	Spurrell 1880a,b; Kennard, 1944; Scott, 2010; Schreve 1997
Creffield Road	St.Barnard's	Top of gravel under "brickearth"	7	e	4	e	e	Terrace stratigraphy	Secondary	?	A	A	P	A	A	A	A	A	A	A	A	A	A	Flint	Brown, 1886, 1887, 1889; Scott, 2010
Creffield Road	School Site	Top of gravel under "brickearth"	7	e	4	e	e	Terrace stratigraphy	Secondary	?	A	A	P	A	A	A	A	A	A	A	A	A	A	Flint	Brown 1886, 1887, 1889; Scott 2010
Selsey	Life Boat Station Channel		7	e	4	e	AAR: MIS 7 (Penkman et al., 2013)	Raised beaches, mammalian and molluscan biostratigraphy	?	No	A	P	P	A	A	A	A	A	A	A	A	A	A	Flint	Parfitt, 1998; White et al., 2006
La Cotte de St. Brelade		H	7?	e	3	TL, but probably not good	e	Raised beaches, mammalian biostratigraphy	Primary	No	A	P	P?	A	A	A	A	A	P	P	A	A	A	Flint	Callow and Cornford, 1986
La Cotte de St. Brelade		G	7?	e	3	e	e	Raised beaches, mammalian biostratigraphy	Primary	No	A	P	P?	A	A	A	A	A	P	P	A	A	A	Flint/ quartzite	Callow and Cornford, 1986
La Cotte de St. Brelade		D	7	e	3	TL (average of 6 samples): 238 ± 35 ka (Huxtable in Callow and Cornford 1986)	e	Raised beaches, mammalian biostratigraphy	Primary	No	A	P	P?	A	A	A	A	A	P	P	A	A	A	Flint	Callow and Cornford, 1986
La Cotte de St. Brelade		C	7	e	3	TL (average of 6 samples): 238 ± 35 ka (Huxtable in Callow and Cornford 1986)	e	Raised beaches, mammalian biostratigraphy	Primary	No	A	P	P	A	A	A	A	A	P	P	A	A	A	Flint	Callow and Cornford, 1986
La Cotte de St. Brelade		B	7	e	3	e	e	Raised beaches, mammalian biostratigraphy	Secondary	No	A	P	P	A	A	A	A	A	P	P	A	A	A	Flint	Callow and Cornford, 1986
La Cotte de St. Brelade		A	7	e	3	e	e	Raised beaches, mammalian biostratigraphy	Primary	Yes	A	P	P	A	P	A	A	A	P	P	A	A	A	Flint	Callow and Cornford, 1986
Aveley	Sandy Lane/ Purfleet Road	Bed 5	7	Late 7	3	e	e	Terrace stratigraphy, mammalian biostratigraghy	?	No	A	P	P?	A	A	A	A	A	A	A	A	A	A	Flint	White et al., 2006; Schreve, 2001b
Crayford	Norris' Pit	Lower Brickearth	7	Late 7	3	e	AAR: late MIS 7 (Penkman et al., 2013); OSL: 70 ka (Scott, 2011)	Terrace stratigraphy, mammalian biostratigraghy	Primary	Yes	A	A	P	A	A	A	A	A	A	P	A	A	A	Flint	Chandler, 1916; Kennard, 1944; Scott, 2010
Brundon	Jordan's Pit	Bed 3	7	Late 7 (7a?)	3	e	U-Series on bone (not cutmarked): 230 ± 30 ka; 174 ± 30 ka (Szabo and Collins, 1975); AAR	Terrace stratigraphy, mammalian biostratigraghy	Secondary	No	A	P	P	A	A	A	A	A	A	A	A	A	A	Flint	Moir and Hopwood 1939; Szabo and Collins, 1975; Wymer, 1985; Schreve, 2001b; Scott, 2010
Holbrook Bay	Stutton and Harkstead	brickearth	7	Late 7?	4	e	AAR: MIS 7 (Penkman et al., 2013)	Terrace stratigraphy, mammalian biostratigraghy	?	No	A	P	P	A	A	A	A	A	A	A	A	A	A	Flint	Wymer, 1985; Wymer 1999; Scott, 2011; Penkman et al., 2013
Ipswich	Stoke Tunnel	Stoke "Bone Bed"	7	Late 7?	3	e	AAR: MIS 7 (Penkman et al., 2013)	Terrace stratigraphy, mammalian biostratigraphy	Secondary	No	A	P	P	A	A	A	A	A	A	A	A	A	A	Flint	Scott 2011; Wymer 1985; White et al., 2006; Penkman et al., 2013
Stanton Harcourt	Dix's Pit	Stanton Harcourt Channel	7	Late 7?	4	e	ESR and U-series (inconclusive) OSL; AAR: MIS 7 (Penkman et al., 2007)	Terrace system, mammalian biostratigraphy	Secondary	No	A	P	P	A	A	A	A	A	A	P	A	A	A	Flint	Buckingham et al., 1996; Buckingham 2007; Penkman et al., 2007
La Cotte de St. Brelade		3	6	e	3	e	e	Raised beaches, mammalian biostratigraphy, lithostratigraphy	Primary	Yes	A	P	P	A	A	A	A	A	P	A	A	A	A	Flint	Callow and Cornford, 1986
La Cotte de St. Brelade		5	6	e	3	e	e	Raised beaches, mammalian biostratigraphy	Primary	Yes	A	P	P	A	P	A	A	P	P	P	A	A	A	Flint	Callow and Cornford, 1986
Cuxton	Rectory site		9 or 7	e	2	e	OSL: 232.64 ± 13.75 ka (RLAHA-X2561); 197.5 þ 17.09 ka (RLAHA-X2563)	Terrace stratigraphy	Primary	No	A	A	A	A	P	A	A	A	?	?	?	?	?	Flint	Wenban-Smith, 2004
Broom		Middle Beds	9- 7?	e	2	e	OSL: between 325 and 205 ka (Toms et al., 2005)	Terrace stratigraphy	Secondary	No	A	A	A	A	P	A	A	A	A	A	A	A	A	Chert	Hosfield and Chambers, 2002, 2009; Hosfield, 2005; Toms et al., 2005
La Cotte de St. Brelade		F	7?	e	1	e	e	Raised beaches, mammalian biostratigraphy	Primary	No	A	P	P	A	A	A	A	A	P	P	A	A	A	Flint/ quartzite	Callow and Cornford 1986

La Cotte de St. Brelade	E	7? e	1	e	e	Raised beaches, mammalian biostratigraphy	Primary	Yes	A	P	P?	A	A	A	A	A	P	P	A	A	A	Flint	Callow and Cornford, 1986	

Table 2
Data of sites of the Netherlands from MIS 9 to 6, mapped in Fig. 3. Sites with a secure MIS correlation (index 3, 4 and 5; cf. Section 3) are in bold, sites with an uncertain MIS correlation (index 0, 1 and 2; cf. Section 3) are in italics.

Site	Precise location	Level/ Layer	MIS	Precise MIS	Value of MIS correlation (x/5)	Direct dating	Indirect dating	Relative chronology	Context	Spatial integrity	Human remains	Faunal remains	Levallois tools	Pebble	"Acheulean" biface	"Mousterian" biface	Trifacial shaping		Discoid	MPCR/ SSDA	Quina	P	Others	Main material	Bibliography raw
Maastricht-Belved ere	Site A	Unit IV (Subunit IV-C-ß)	7 (or possibly 9)	e	5	TL on burnt flint: average of ten fine grained dates, all deriving from the Unit IV archaeological sites ¼ 250 ± 20 ka (Huxtable, 1993; Oxford reference number 712Kft)	ESR dating on Unit IV molluscs: 220 ± 40 ka (Van Kolfschoten et al., 1993)	MIS7 (Pedostratigraphy, lithostratigraphy, terrace stratigraphy, mammal biostratigraphy (Van Kolfschoten and Roebroeks, 1985; Roebroeks, 1988; Vandenberghe et al., 1993)), or MIS 9 (AAR, molluscan biostratigraphy (Meijer and Cleveringa 2009))	Primary	Yes?	A	A	A	A	A	A	A	A	A	A	A	A	P (Unprepared technology)	Flint	Van Kolfschoten and Roebroeks, 1985; Roebroeks, 1988; Roebroeks et al., 1992; Vandenberghe et al., 1993; De Loecker, 2006; De Warrimont and Stassenstraat, 2007; Roebroeks et al., 2012; De Loecker and Roebroeks, 2012
Maastricht-Belved ere	Site B	Unit IV (Subunit IV-B)	7 (or possibly 9)	e	5	TL on burnt flint: average of ten fine grained dates, all deriving from the Unit IV archaeological sites ¼ 250 ± 20 ka (Huxtable, 1993; Oxford reference number 712Kft)	ESR dating on Unit IV molluscs: 220 ± 40 ka (Van Kolfschoten et al., 1993)	MIS7 (Pedostratigraphy, lithostratigraphy, terrace stratigraphy, mammal biostratigraphy (Van Kolfschoten and Roebroeks, 1985; Roebroeks, 1988; Vandenberghe et al., 1993)), or MIS 9 (AAR, molluscan biostratigraphy (Meijer and Cleveringa, 2009))	Primary	?	A	P (very few)	A	A	A	A	A	A	A	A	A	P?	A	Flint	Van Kolfschoten and Roebroeks, 1985; Roebroeks 1988; Roebroeks et al., 1992; Vandenberghe et al., 1993; De Loecker, 2006; De Warrimont and Stassenstraat, 2007; Roebroeks et al., 2012; De Loecker and Roebroeks, 2012
Maastricht-Belved ere	Site C	Unit IV (Subunit IV-B)	7 (or possibly 9)	e	5	TL on burnt flint: average of ten fine grained dates, all deriving from the Unit IV archaeological sites ¼ 250 ± 20 ka (Huxtable, 1993; Oxford reference number 712Kft)	ESR dating on Unit IV molluscs: 220 ± 40 ka (Van Kolfschoten et al., 1993)	MIS7 (Pedostratigraphy, lithostratigraphy, terrace stratigraphy, mammal biostratigraphy (Van Kolfschoten and Roebroeks 1985; Roebroeks, 1988; Vandenberghe et al., 1993)), or MIS 9 (AAR, molluscan biostratigraphy (Meijer and Cleveringa, 2009))	Primary	Yes	A	P (poorly preserved)	P (frequent)	A	A	A	A	A	P	A	A	P	A	Flint	Van Kolfschoten and Roebroeks, 1985; Roebroeks 1988; Roebroeks et al., 1992; Vandenberghe et al., 1993; De Loecker, 2006; De Warrimont and Stassenstraat, 2007; Roebroeks et al., 2012; De Loecker and Roebroeks, 2012
Maastricht-Belved ere	Site D (30-m long section)	Unit IV (Subunit IV-C-ß)	7 (or possibly 9)	e	5	TL on burnt flint: average of ten fine grained dates, all deriving from the Unit IV archaeological sites ¼ 250 ± 20 ka (Huxtable, 1993; Oxford reference number 712Kft)	ESR dating on Unit IV molluscs: 220 ± 40 ka (Van Kolfschoten et al., 1993)	MIS7 (Pedostratigraphy, lithostratigraphy, terrace stratigraphy, mammal biostratigraphy (Van Kolfschoten and Roebroeks, 1985; Roebroeks, 1988; Vandenberghe et al., 1993)), or MIS 9 (AAR, molluscan biostratigraphy (Meijer and Cleveringa 2009))	Primary	?	A	A	A	A	A	A	A	A	P	A	A	P	A	Flint	Van Kolfschoten and Roebroeks, 1985; Roebroeks, 1988; Roebroeks et al., 1992; Vandenberghe et al., 1993; De Loecker, 2006; De Warrimont and Stassenstraat, 2007; Roebroeks et al., 2012; De Loecker and Roebroeks, 2012
Maastricht-Belved ere	Site F	Unit IV (Subunit IV-C-ß)	7 (or possibly 9)	e	5	TL on burnt flint: average of ten fine grained dates, all deriving from the Unit IV archaeological sites ¼ 250 ± 20 ka (Huxtable, 1993; Oxford reference number 712Kft)	ESR dating on Unit IV molluscs: 220 ± 40 ka (Van Kolfschoten et al., 1993)	MIS7 (Pedostratigraphy, lithostratigraphy, terrace stratigraphy, mammal biostratigraphy (Van Kolfschoten and Roebroeks, 1985; Roebroeks, 1988; Vandenberghe et al., 1993)), or MIS 9 (AAR, molluscan biostratigraphy (Meijer and Cleveringa 2009))	Primary	Yes (some rearrangement)	A	A	A	A	A	A	A	A	P (frequent)	A	A	P	A	Flint	Van Kolfschoten and Roebroeks 1985; Roebroeks, 1988; Roebroeks et al., 1992; Vandenberghe et al., 1993; De Loecker, 2006; De Warrimont and Stassenstraat, 2007; Roebroeks et al., 2012; De Loecker and Roebroeks, 2012
Maastricht-Belved ere	Site G	Unit IV (Subunit IV-B)	7 (or possibly 9)	e	5	TL on burnt flint: average of ten fine grained dates, all deriving from the Unit IV archaeological sites ¼ 250 ± 20 ka (Huxtable, 1993; Oxford reference number 712Kft)	ESR dating on Unit IV molluscs: 220 ± 40 ka (Van Kolfschoten et al., 1993)	MIS7 (Pedostratigraphy, lithostratigraphy, terrace stratigraphy, mammal biostratigraphy (Van Kolfschoten and Roebroeks 1985; Roebroeks, 1988; Vandenberghe et al., 1993)), or MIS 9 (AAR, molluscan biostratigraphy (Meijer and Cleveringa 2009))	Primary	Yes	A	P	A	A	A	A	A	A	A	A	A	P	A	Flint	Van Kolfschoten and Roebroeks, 1985; Roebroeks, 1988; Roebroeks et al., 1992; Vandenberghe et al., 1993; De Loecker, 2006; De Warrimont and Stassenstraat, 2007; Roebroeks et al., 2012; De Loecker and Roebroeks, 2012
Maastricht-Belved ere	Site H	Unit IV (Subunit IV-C-ß)	7 (or possibly 9)	e	5	TL on burnt flint: average of ten fine grained dates, all deriving from the Unit IV archaeological sites ¼ 250 ± 20 ka (Huxtable, 1993; Oxford reference number 712Kft)	ESR dating on Unit IV molluscs: 220 ± 40 ka (Van Kolfschoten et al., 1993)	MIS7 (Pedostratigraphy, lithostratigraphy, terrace stratigraphy, mammal biostratigraphy (Van Kolfschoten and Roebroeks, 1985; Roebroeks, 1988; Vandenberghe et al., 1993)), or MIS 9 (AAR, molluscan biostratigraphy (Meijer and Cleveringa, 2009))	Primary	Yes	A	A	A	A	A	A	A	A	P (frequent)	A	A	P	A	Flint	Van Kolfschoten and Roebroeks, 1985; Roebroeks, 1988; Roebroeks et al., 1992; Vandenberghe et al., 1993; De Loecker, 2006; De Warrimont and Stassenstraat, 2007; Roebroeks et al., 2012; De Loecker and Roebroeks, 2012
Maastricht-Belved ere	Site K	Unit IV (Subunit IV-C-ß)	7 (or possibly 9)	e	5	TL on burnt flint: average of ten fine grained dates, all deriving from the Unit IV archaeological sites ¼ 250 ± 20 ka (Huxtable, 1993; Oxford reference number 712Kft)	ESR dating on Unit IV molluscs: 220 ± 40 ka (Van Kolfschoten et al., 1993)	MIS7 (Pedostratigraphy, lithostratigraphy, terrace stratigraphy, mammal biostratigraphy (Van Kolfschoten and Roebroeks, 1985; Roebroeks, 1988; Vandenberghe et al., 1993)), or MIS 9 (AAR, molluscan biostratigraphy (Meijer and Cleveringa, 2009))	Primary	Yes	A	A	P (mainly on scrapers)	A	A	A	A	A	P (frequent)	A	A	P	A	Flint	Van Kolfschoten and Roebroeks, 1985; Roebroeks, 1988; Roebroeks et al., 1992; Vandenberghe et al., 1993; De Loecker, 2006; De Warrimont and Stassenstraat, 2007; Roebroeks et al., 2012; De Loecker and Roebroeks, 2012

Maastricht-Belved ere	Site N	Unit IV (Subunit IV-C-ß)	7 (or possibly 9)		5	TL on burnt flint: average of ten fine grained dates, all deriving from the Unit IV archaeological sites ¼ 250 ± 20 ka (Huxtable, 1993; Oxford reference number 712Kft)	ESR dating on Unit IV molluscs: 220 ± 40 ka (Van Kolfschoten et al., 1993)	MIS7 (Pedostratigraphy, lithostratigraphy, terrace stratigraphy, mammal biostratigraphy (Van Kolfschoten and Roebroeks 1985; Roebroeks, 1988; Vandenberghe et al., 1993)), or MIS 9 (AAR, molluscan biostratigraphy (Meijer and Cleveringa, 2009))	Primary	Yes	A	P (poorly preserved)	P (mainly on scrapers)	A	A	A	A	A	A	A	A	P (well-prepared)	A	Flint	Van Kolfschoten and Roebroeks, 1985; Roebroeks, 1988; Roebroeks et al., 1992; Vandenberghe et al., 1993; De Loecker, 2006; De Warrimont and Stassenstraat, 2007; Roebroeks et al., 2012; De Loecker and Roebroeks, 2012
Rhenen	Different locations (Wageningen, Lunteren, Soesterberg, Maarn, Amersfoort, Gooimeer)	S3 (Rhenen industry)	6 or older?	Early 6 or older?	2	e	OSL date for Unit S3: 168 ± 19 ka; alongside additional OSL dates for under- and overlying deposits (Busschers et al., 2008; Van Balen and Busschers, 2010)	Lithostratigraphy, mammalian biostratigraphy	Secondary	No	A	P	P	A	P?	?	A	A	A?	A?	A?	P	?	Flint	Stapert, 1981, 1987, 1991; Niekus and Stapert, 2005 (and references therein) Van Balen, 2006; van Balen et al., 2007; Busschers et al., 2008; van Balen and Busschers, 2010

Table 3

Data of sites of Belgium from MIS 9 to 6, mapped in Fig. 3. Sites with a secure MIS correlation (index 3, 4 and 5; cf. Section 3) are in bold, sites with an uncertain MIS correlation (index 0, 1 and 2; cf. Section 3) are in italics.

Site	Precise location	Level/Layer	MIS	Precise MIS	Value of MIS correlation (x/5)	Direct dating	Indirect dating	Relative chronology	Context	Spatial integrity	Human remains	Faunal remains	Levallois	Pebble tools	"Acheulean" biface	"Mousterian" biface	Trifacial shaping	Blade	Discoid	MPCR/SSDA	Quina	PCT	Others	Main raw material	Bibliography
Kesselt	Op de Schans	3	9/8	Late 9/early 8	4	e	Several OSL and ITL dates on loess deposits overlying the main occupation horizon (¼ archaeological level 3) (Van de Moortel, 2008)	Lithostratigraphy, terrace system	Primary	Yes	A	A	P	A	A	A	A	A	P	A	A	P	P	Flint	Van Baelen et al., 2007, 2008, 2011; Van de Moortel, 2008; Meijs et al., 2012; Van Baelen, 2014
Mesvin terrace	e	e	8	e	4	e	e	Lithostratigraphy, terrace system	Secondary	No	A	P	P	A	P?	A?	A	A	?	?	A	P	?	Flint	Briart et al., 1872; Haesaerts, 1978; Cahen et al., 1979; Michel, 1983; Cahen, 1984; Pirson et al., 2009
Petit-Spiennes III	e	e	8	e	3	e	e	Lithostratigraphy, terrace system	Secondary	No	A	P	P	A	A?	P?	A	A	A?	A	A	P	P?	Flint	Cahen and Haesaerts, 1982, 1983; Cahen et al., 1985; Cahen, 1984; Watteyne, 1985; Pirson et al., 2009
Mesvin IV	e	e	8	e	4	4 U/Th dates available on bone and teeth, giving an average of 287 ± 12 ka; Consequently, the site is generally placed around 300e250 ka (Szabo in Cahen et al., 1984)	e	Lithostratigraphy, Biochronology (mammalian), Terrace system	Secondary	No	A	P	P	A	A	P	A	A	P	A	A	P	P	Flint	Cahen and Haesaerts, 1981; Roche, 1981; Gysels and Cahen, 1981; Van Neer 1981, 1985, 1986; Cahen et al., 1984; Cahen and Michel, 1986; Soriano, 2000, 2001; Ryssaert, 2004, 2005, 2006a, 2006b; Van Asperen, 2008; Pirson et al., 2009
Kesselt	Nelissen	A1	7	e	3	e	3 TL dates (R1/2, R1/3, R1/4) on sediment from Hees Soil (¼ X-Soil) in Nelissen brickyard pit are available, giving an average age of 297 ± 34 ka; several additional TL (sediment) and 14C (snails, humic material) dates are available for overlying loess deposits (Haesaerts et al., 1981; Gullentops, 1991; Huijzer, 1993; Vandenberghe et al., 1998; Van den haute et al., 1998, 2003; Wintle unpublished)	Lithostratigraphy, terrace system	Primary?	?	A	A	A	A	A	A	A	A	A	A	A	A	P	Flint	Meijs and Groenendijk, 1999; Groenendijk et al., 2001; Meijs, 2002
Kesselt	Op de Schans	2	7	e	3	e	Several OSL and ITL dates on loess deposits under- and overlying the archaeological level 2 (Van de Moortel, 2008)	Lithostratigraphy, terrace system	Secondary?	?	A	A	?	?	A	A	?	?	?	?	?	?	?	Flint	Van de Moortel, 2008; Meijs, personal communication; Meijs et al., 2012
Saint-Symphorien	Carriere Helin	'Cailloutis C', also 'Cailloutis inferieur'	6	e	3	AAR date on bone (from Cailloutis inferieur) of 286 ka (Cubuk, 1975), but date rejected due to imprecision dating technique and possible reworked character of the sample (Haesaerts, 1978)	e	Lithostratigraphy, terrace system	Secondary	No	A	A	P	A?	A	A	A	P?	P	A	A	P	P	Flint	De Heinzelin, 1959; Cubuk, 1975; Michel, 1978; Haesaerts, 1978; Cahen, 1984; Escutenaire, 1996; Di Modica, 2009; Pirson et al., 2009; Pirson and Di Modica, 2011
Veldwezelt	Hezerwater	BDA	6	e	3	e	e	Lithostratigraphy	Secondary	No	A	A	?	A	A	A	A	A	?	A	A	?	P	Flint	Bringmans et al., 2001a,b, 2003; Bringmans, 2006a, 2006b, 2007; Meijs, 2011; Pirson and Di Modica, 2011
Veldwezelt	Hezerwater	TDA	6	e	3	e	e	Lithostratigraphy	Secondary	No	A	A	P?	A	A?	A	A	A	?	A	A	P?	P	Flint	Bringmans et al., 2001a,b, 2003; Bringmans, 2006a, 2006b, 2007; Meijs, 2011; Pirson and Di Modica, 2011
Veldwezelt	Hezerwater	GRA0	6	e	3	e	e	Lithostratigraphy	Secondary	No	A	A	?	A	A	A	A	A	?	A	A	?	P	Flint	Bringmans et al., 2001a,b, 2003; Bringmans, 2006a, 2006b, 2007; Meijs, 2011; Pirson and Di Modica, 2011
Veldwezelt	Hezerwater	ZNB	6	e	3	e	e	Lithostratigraphy	Primary?	?	A	A	P?	A	A	A	A	A	?	A	A	P?	P	Flint	Bringmans et al., 2001a,b, 2003; Bringmans, 2006a, 2006b, 2007; Meijs, 2011; Pirson and Di Modica, 2011
Veldwezelt	Hezerwater	GRA1	6	e	3	e	e	Lithostratigraphy	Secondary	No	A	A	P	A	A	A	A	A	?	A	A	P	P	Flint	Bringmans et al., 2001a,b, 2003; Bringmans, 2006a, 2006b, 2007; Meijs, 2011; Pirson and Di Modica, 2011
Trooz	Grotte Walou	DI	6	e	4	ESR/UeTh on mammal teeth from younger levels CII-4 and CII-7; 14C on bone, antler, charcoal and humic	TL on heated limestone from younger level CV-2 (mean weighted age 90.3 ± 4.6 ka)	Lithostratigraphy, biochronology (macro- and microfauna), tephrachonology, palynology, anthracology	Secondary?	No?	A	A	P	A	A	A	A	A	A	A	A	P	P?	Flint	Draily, 2011a,b; Pirson et al., 2011; Pirson and Di Modica, 2011

						sediment from younger levels A-6, B-1, B-4, B-5, C0-C5A, CI-1 to CI-6, CI-8																		
Masnuy-Saint-Jean	Le Rissori	IV (part of 'series brunes')	8	e	2	e	e	Lithostratigraphy, terrace system	Secondary	No	A	A	P	A	A	A	A	P	A	A	A	P	A	Flint	Lefrancq, 1955; Adam and Tuffreau, 1973; Locht, 1990; Adam, 1991, 2002; Pirson and Di Modica, 2011
Masnuy-Saint-Jean	Le Rissori	IIIA (part of 'series brunes')	8 or 6?	e	2	e	e	Lithostratigraphy, terrace system	Secondary	No	A	A	P	A	A	A	A	P	A	A	A	P	A	Flint	Lefrancq, 1955; Adam and Tuffreau, 1973; Locht, 1990; Adam, 1991, 2002; Pirson and Di Modica, 2011
	Le Rissori		8 or 7?	8 or 7b?	2	e	e		Secondary	No	A	A	P	A	A	A	A	P	A	A	A	P	A	Flint	

(continued on next page)

Table 3 (continued)

Site	Precise location	Level/Layer	MIS	Precise MIS	Value of MIS correlation (x/5)	Direct dating	Indirect dating	Relative chronology	Context	Spatial integrity	Human remains	Faunal remains	Levallois	Pebble tools	"Acheulean" biface	"Mousterian" biface	Trifacial shaping		Discoid	MSSDA			Others	M material	Bibliography raw
Masnuy-Saint-Jean		IIIB (part of 'series brunes')						Lithostratigraphy, terrace system																	Lefrancq, 1955; Adam and Tuffreau, 1973; Locht, 1990; Adam, 1991, 2002; Pirson and Di Modica, 2011
Liege	Mont Saint- (more specifically at Court Saint-Hubert)	G-a Martin	6 or 5d?	e	2	e	e	Lithostratigraphy	?	?	A	A	P	A	A	A	?	P?	?	?	?	P	?	Flint	Haesaerts et al., 2008; Van der Sloot et al., 2009, 2011
Saint-Symphorien	Carriere Helin	S.J.	6?	e	2	AAR date on bone on underlying stratigraphic level (see information Cailloutis inferieur)	e	Lithostratigraphy, terrace system	Secondary	No	A	A	P	A	A	A	A	A	A	A	A	P	?	Flint	De Heinzelin, 1959; Cubuk, 1975; Michel, 1978; Haesaerts, 1978; Cahen, 1984; Escutenaire, 1996; Di Modica, 2009; Pirson et al., 2009; Pirson and Di Modica, 2011
Harmignies	e	DA1	6?	e	2	e	e	Lithostratigraphy	?	?	A	A	?	A	A	A	A	A	?	?	?	?	?	Flint	Haesaerts, 1974; Haesaerts and Van Vliet, 1974; De Heinzelin et al., 1975; Pirson and Di Modica, 2011
Kesselt	Nelissen	A2	6?	e	2	e	Multiple TL (sediment) and 14C (snails, humic material) dates are available for loess deposits (Haesaerts et al., 1981; Gullentops 1991; Huijzer, 1993; Vandenberghe et al., 1998; Van den haute et al., 1998, 2003; Wintle, unpublished); 3 TL dates on sediment are available for underlying luvisol (Van den haute, De Corte, 2001)	Lithostratigraphy, overlying loess terrace system	Secondary	No	A	A	A	A	A	A	A	A	A	A	A	A	P	Flint	Meijs and Groenendijk, 1999; Groenendijk et al., 2001; Meijs, 2002
Veldwezelt	Hezerwater	VLL	Previous: 6 or 5?; now: 5	Previous: late 6 (6.01) or 5d?; now: 5d	2	e	e	Lithostratigraphy	Primary	Yes	A	A	A	A	A	A	A	A	A	A	A	A	P	Flint	Bringmans et al., 2001a,b, 2003; Bringmans, 2006a, 2006b, 2007; Meijs, 2011; Pirson and Di Modica, 2011
Veldwezelt	Hezerwater	VLB	Previous: 6 or 5?; now: 5	Previous: late 6 (6.01) or 5d?; now: 5d	2	e	e	Lithostratigraphy	Primary	Yes	A	A	P	A	A	A	A	A	A	A	A	P	P	Flint	Bringmans et al., 2001a,b, 2003; Bringmans, 2006a, 2006b, 2007; Meijs, 2011; Pirson and Di Modica, 2011
Otrange	Gisement paleolithique	L.S.	6?	e	1	e	e	Lithostratigraphy	Primary	Yes	A	A	P	A	A	A	A	A	P	P	A	P	P	Flint	Thisse-Derouette and Destexhe-Jamotte 1947, 1949; De Heinzelin de Braucourt 1950; Ulrix-Closset, 1975; Otte, 1979; Jungels, 2004, 2005; Di Modica and Jungels, 2009; Di Modica, 2010
Otrange	Gisement paleolithique	G.B.	6?	e	1	e	e	Lithostratigraphy	Secondary	No	A	A	A?	A?	P?	P?	?	?	?	?	?	A?	?	Flint	Thisse-Derouette and Destexhe-Jamotte 1947, 1949; De Heinzelin de Braucourt, 1950; Ulrix-Closset, 1975; Otte, 1979; Jungels, 2004, 2005; Di Modica and Jungels, 2009; Di Modica, 2011
Liege	Sainte-Walburge	'Niveau inferieur' (also 'couche G', also 'Niveau C1 & C2 de Commont')	6?	e	1	e	e	Lithostratigraphy	Secondary	No	A	A	P	P (¼ 1 hammertsone)	P	A?	A	A	P	A	A	P	P	Flint	Lohest and Fraipont, 1912; De Puydt et al., 1912; De Puydt, 1922; Ulrix-Closset, 1975; Roebroeks, 1981
Trooz	Grotte Walou DII		6-11?	e	1	ESR/UeTh on mammal teeth from younger level CV-2 (mean weighted age younger levels CII-4 and CII-7; 14C on bone, antler, charcoal and humic sediment from younger levels A-6, B-1, B-4, B-5, C0-C5A, CI-1 to CI-6, CI-8	TL on heated limestone from younger level CV-2 (mean weighted age 90.3 ± 4.6 ka)	Lithostratigraphy, biochronology (macro- and microfauna), tephrachonology, palynology, anthracology	Secondary?	No?	A	A	A?	A	A	A	A	A	A	A	A	A?	P?	Flint	Draily, 2011a,b Pirson et al., 2011; Pirson and Di Modica, 2011
Moha	Grotte de l'Hermitage	-	6?	e	0	e	e	e	?	?	A	P	P	A	P?	?	A	A	P	A	A	P	P	Flint	Fraipont and Tihon, 1896; Ulrix-Closset, 1975; Cordy, 1984; Sitlivy, 1996; Van Peer, 2001; Di Modica, 2004

D.H erissonetal./QuaternaryInternational411(2016)233 e 283

Huccorgne	Abri Sandron	-	6?	e	0	e	e	e	?	?	A	P	P	A	P?	?	A	A	?	A	A	P	?	Flint	De Loe, 1883; Fraipont and Tihon, 1896; Ulrix-Closset, 1975; Cordy, 1984; Van Peer, 2001

Table 4
Data of German sites from MIS 9 to 6, mapped in Fig. 4. Sites with a secure MIS correlation (index 3, 4 and 5; cf. Section 3) are in bold, sites with an uncertain MIS correlation (index 0, 1 and 2; cf. Section 3) are in italics.

Site	Level/Layer	MIS	Precise MIS	Value of MIS correlation (x/5)	Direct dating	Indirect dating	Relative chronology	Context	Spatial integrity	Human remains	Faunal remains	Levallois	Pebble tools	“Acheulean” biface	“Mousterian” biface	Trifacial shaping	Blade	Discoid	MPCR/SSDA	Quina	PCT	Others	Main raw material	Bibliography
Steinheim		9/8	?	4	e	Late “Holsteinian”	Lithostratigraphy, biochronology (travertine)	Secondary	No	P	P	A	A	A	A	A	A	A	A	A	P	A	No lithic artefacts	Adam, 1988
Schoningen€	12-B, 12-II	9/8	Late 9/ early 8	4	In preparation	e	Lithostratigraphy (lake shore)	Primary	Yes	A	P	A	A	A	A	A	A	A	A	A	P	A	Flint	Thieme, 2007; Serangeli et al., 2012; Serangeli and Conard, 2015
Schoningen€	13-II-4	9/8	Late 9/ early 8	4	In preparation	e	Lithostratigraphy (lake shore)	Primary	Yes	A	P	A	A	A	A	A	A	A	A	A	P	A	Flint	Thieme, 2007; Serangeli et al., 2012; Serangeli and Conard, 2015
Ariendorf	1	8	Late 8	4	e	e	Lithostratigraphy (loess, tephra)	Primary	Yes	A	P	P	A	A	A	A	A	A	A	A	A	A	Quartz, Quartzite	Bosinski et al., 1983; Turner et al., 1997; Richter, 2011
Rheindahlen	B3	7	7.2	3	e	TL series from >142 to >194 ka (Frechen et al., 1992; correction of Zoller et al., 1988€)	Lithostratigraphy (loess and soil)	Primary	Yes	A	A	P	A	A	A	A	A	A	A	A	A	A	Flint	Schmitz and Thissen 1998; Ikinger, 2002; Thissen, 2006
Rheindahlen	B2	7	7.1	3	e	TL series from >142 to >194 ka (Frechen et al., 1992; correction of Zoller et al., 1988€)	Lithostratigraphy (loess and soil)	Secondary	N	A	A	A	A	A	P	A	A	A	A	A	A	A	Flint	Schmitz and Thissen, 1998; Ikinger, 2002; Thissen, 2006
Rheindahlen	B1	7	7.1	3	e	TL series from >142 to >194 ka (Frechen et al., 1992; correction of Zoller et al., 1988€)	Lithostratigraphy (loess and soil)	Primary	Partial preservation?	A	A	A	A	A	A	A	P	A	A	A	A	A	Flint	Schmitz and Thissen 1998; Ikinger, 2002; Thissen, 2006

Ehringsdorf	LT, lower travertines (six layers)	7	Late 7	3	Series of similar ESR dates produced a 204 ka medium age of both UT and OT layers (Schüler, 2004)	e	Lithostratigraphy, biochronology (travertine)	Primary	No	P	P	P?	A	A	P	A	A	A	A	A	A	A	Flint	Behm-Blancke, 1960; Kahlke, 1958; Heinrich, 1981; Sch€afer, 1993; Schüler, 2004
Ehringsdorf	UT, upper travertines	7	Late 7	3	Series of similar ESR dates produced a 204 ka medium age of both UT and OT layers (Schüler, 2004)	e	Lithostratigraphy, biochronology (travertine)	Primary	No	A	P	P?	A	A	P	A	A	A	A	A	A	A	Flint	Behm-Blancke, 1960; Kahlke, 1958; Heinrich, 1981; Sch€afer, 1993; Schüler, 2004
Hunas	G	7/6	?	5	In preparation	In preparation	Lithostratigraphy, biochronology	Primary	No	P	P	P	P	A	A	A	A	A	A	A	A	A	Hornfels	Rosendahl et al., 2006
Rheindahlen	A3	6	Early 6	3	e	e	Lithostratigraphy (loess and soil)	Secondary	No	A	A	A	A	A	A	P	A	A	A	A	A	A	Flint	Schmitz and Thissen, 1998; Ikinger 2002; Thissen 2006
Rheindahlen	A2	6	Early 6	3	e	e	Lithostratigraphy (loess and soil)	Secondary	No	A	A	A	A	A	A	P	A	A	A	A	A	A	Flint	Schmitz and Thissen, 1998; Ikinger, 2002; Thissen, 2006
Zwochau		6	Early 6	4	e	e	Lithostratigraphy (moraine)	Primary	Yes	A	P	P	A	A	A	A	A	A	A	A	A	A	Flint	Pasda, 1996
Wannen		6	Early 6	3	e	e	Tephra chronology	Primary	Yes	P	P	A	A	A	A	A	A	A	A	A	P	A	Flint, quartz	Justus, 2000
Ariendorf	2	6	Middle 6	4	e	e	Lithostratigraphy (loess, tephra)	Primary	Yes	A	P	A	A	A	A	A	A	A	A	A	P	A	Quartz, quartzite	Bosinski et al., 1983; Turner et al., 1997; Richter, 2011
Schweinskopf	4	6	e	4	e	e	Tephra chronology	Primary	Yes	A	P	P	A	A	A	A	A	A	A	A	A	A	Quartz, quartzite	Schafer, 1990€
Markkleeberg		6	?	3	e	e	Lithostratigraphy (moraine)	Primary	No	A	P	P	A	P	A	A	A	A	A	A	A	A	Flint	Baumann and Mania, 1983; Schafer, 1993; Sch€ afer et al., 2003€
Tonchesberg€	2A	6	Late 6	3	TL: 129 ± 12 ka; 121 ± 11 ka (Sch€afer, 1993)	e	Lithostratigraphy (loess and soil)	Secondary	No	A	P	A	A	A	A	A	A	A	A	A	P	A	Quartz	Conard 1992
Murg-Kalvarienberg		6	Late 6/5	3	e	e	Lithostratigraphy (loess and soil)	Secondary	No	A	P	P?	A	A	A	A	A	P?	A	A	A	A	Hornfels	Pasda 1994
Hundisburg		6	?	2	e	e	Lithostratigraphy (moraine)	secondary	No	A	P	P	A	P	P	A	P	A	A	A	A	A	Flint	Ertmer 2012

Table 5
Data of North-east French sites from MIS 9 to 6, mapped in Fig. 5. Sites with a secure MIS correlation (index 3, 4 and 5; cf. Section 3) are in bold, sites with an uncertain MIS correlation (index 0, 1 and 2; cf. Section 3) are in italics.

Site	Exact location	Level/Layer	MIS	Precise MIS	Value of MIS correlation (x/5)	Direct dating	Indirect dating	Relative chronology	Context	Spatial integrity	Human remains	Faunal remains	Levallois	Pebble tools	"Acheulean" biface	"Mousterian" biface	Trifacial shaping	Blade	Discoid	MPCR/SSDA	Quina	PCT	Others	Main raw material	Bibliography

L'Epinette	Cagny	I (I0, I1, I2)	9	Early 9	5	US-ESR on teeth: 318 ± 48 ka; 289 ± 43 ka; 291 ± 44 ka (Bahain et al., 2007)	ESR on sediment: 296 ± 53 ka (Laurent, 1993)	Lithostratigraphy, biochronology, palynology, terrace system	Primary	Yes	A	P	A	A	P	A	A	A	A	P	A	A	P	Flint	Antoine and Tuffreau, 1993; Laurent, 1993; Tuffreau et al., 1995; Dibble et al., 1997; Lamotte, 1999; Bahain et al., 2001, 2007; Tuffreau et al., 2008
Etricourt-Manancourt	Secteur 2	HUZ	9	9c	5	e	IRSL in progress	Lithostratigraphy	Primary	Yes/No	A	A	A	A	P	A	A	A	A	P	A	A	A	Flint	Herisson and Goval, 2013; H erisson et al., 2015; Herisson et al., 2016
Etricourt-Manancourt	Secteur 2	HUD	9/8	9a	5	TL on burnt flint: 274 ± 32 ka, 294 ± 25 ka, 288 ± 26 ka (Herisson dir., 2015)	IRSL in progress	Lithostratigraphy	Primary	Yes	A	A	P	A	P	A	A	A	A	P	A	P	A	Flint	Herisson and Goval, 2013; H erisson et al., 2015; Herisson et al., 2016
Soucy		5-II	9	e	5	U/Th on teeth: 356 ± 53 ka and 399 ± 60 ka (Chausse, 2003)	U/Th on teeth (unit2, under site 5): average 362 ± 27 ka (Chausse, 2003)	Lithostratigraphy, terrace system, biochronology	Primary	Yes	A	P	A	A	P	A	A	A	P	P	A	A	A	Flint	Lhomme et al., 2000a, 2004; Chausse, 2003; Lhomme, 2007
Soucy		5-I	9	e	5	U/Th on teeth: average 323 ± 24 ka (Chausse, 2003)	U/Th on teeth (unit2, under site 5): average 362 ± 27 ka (Chausse, 2003)	Lithostratigraphy, terrace system, biochronology	Primary	Yes	A	P	A	A	P	A	A	A	P	P	A	A	P	Flint	Lhomme and Connet, 2001; Chausse, 2003; Lhomme et al., 2004; Lhomme, 2007
Soucy		3-P	9	e	5	U/Th on teeths: average 361 ± 30 ka (Chausse, 2003)	e	Lithostratigraphy, terrace system, biochronology	Primary	Yes	A	P	A	A	P	A	A	A	A	A	A	A	P	Flint	Lhomme et al., 2000b, 2004; Chausse, 2003; Lhomme, 2007; Nicoud, 2011; Chausse, 2003
Soucy		1	9	e	5	e	e	Lithostratigraphy, terrace system, biochronology	Primary	Yes	A	P	A	A	P	A	A	A	A	A	A	A	P	Flint	Lhomme et al., 1998a,b, 2000b, 2004; Chausse, 2003; Lhomme, 2007
Soucy		5-0	9	e	5	e	U/Th on teeth (unit2, under site 5): average 362 ± 27 ka (Chausse, 2003)	Lithostratigraphy, terrace system, biochronology	Primary	Yes	A	P	A	A	P	A	A	A	A	A	A	A	P	Flint	Lhomme et al., 2000a, 2004; Chausse, 2003; Lhomme, 2007
Soucy		3-S	9	e	5	e	e	Lithostratigraphy, terrace system, biochronology	Primary	Yes	A	P	A	A	P	A	A	A	A	A	A	A	P	Flint	Lhomme et al., 2000a, 2004; Chausse, 2003; Lhomme, 2007
Soucy		2	9	e	5	e	e	Lithostratigraphy, terrace system, biochronology	Primary	No?	A	P	A	A	A	A	A	A	A	P	A	A	A	Flint	Lhomme et al., 2000a, 2004; Chausse, 2003; Lhomme, 2007
Plachy-Buyon		N3	9	e	4	e	e	Lithostratigraphy	Primary/ secondary	No	A	A	A	A	P	A	A	A	A	P	A	A	A	Flint	Locht et al., 1995
Revelles	Les Terres-Sellier	-	9	e	3	TL on burnt flint: 291.6 ± 28 ka; 263.6 ± 26.2 ka (Debenham, unpublished)	IRSL in progress	Lithostratigraphy	Secondary	No	A	A	A	A	P	A	A	A	A	P	A	P	A	Flint	Guerlin et al., 2008
Clairy-Saulchoix	Le Champ Mugotte e - Au Chemin de Pissy		9	e	3	e	e	Lithostratigraphy	Secondary	No	A	A	A	A	P	A	A	A	A	A	A	A	P	Flint	Sellier, 2002; Lhomme et al., 2002; Rocca, 2005
Saint-Valery-sur-Somme		SO	8	e	3	e	e	Lithostratigraphy	Primary	?	A	A	A	A	A	A	A	P	A	A	A	A	A	Flint	De Heinzelin and Haesaerts, 1983
Biache-Saint-Vaast		H	7	7e	5	ESR (US) on bone: 258 ± 26 ka (Bahain, 2007); ESR (US) on bone: 245 ± 28 ka (Bahain et al., 2015)	e	Lithostratigraphy, biochronology, terrace system	Primary	No	A	P	P	A	A	A	A	A	A	A	A	A	P	Flint	Marcy, 1986, 1988; Tuffreau, 1986; Leroy, 1990; Ameloot-Van der Heijden, 1991; Auguste, 1994, 1995a, 1995b, 2003, 2012; Auguste and Patou-Mathis, 1994; Louguet, 2004, 2005; Bahain, 2007; Goubel, 2011; Herisson, 2012
Biache-Saint-Vaast		IIA	7	7e	5	TL on burnt flint (underestimated due to none e dosimetric values): 175 ± 13 ka (Huxtable and Aitken, 1988); Gamma ray spectrometry on human skull: 263 þ 53/37 ka (Yokoyama, 1989); upper UePa on human skull: >175 ka (Yokoyama, 1989); ESR (US) on bone: 230 ± 24 ka and on tooth: 229 ± 27 ka (Bahain, 2007); 219 ± 30 ka (Bahain et al., 2015)		Lithostratigraphy, biochronology, terrace system	Primary	Yes and No	P	P	P	A	A	A	A	A	A	A	A	A	P	Flint	Vandermeersch, 1978; Piningre, 1978; Boeda,€ 1986, 1988a,b, 1994; Marcy, 1986, 1988; Tuffreau, 1986, 1988a; Beyries, 1988; Huxtable and Aitken, 1988; Yokoyama, 1989; Ameloot-Van der Heijden, 1991; Burie, 1992, 1996; Bahain et al., 1993; Auguste, 1994, 1995a, 1995b, 2003, 2012; Auguste and Patou-Mathis, 1994; Dibble, 1995; Leblanc, 1999; Rougier, 1999, 2003; Marx, 2001; Louguet, 2004, 2005; Auguste et al., 2005; Guipert, 2005; Louguet, 2006; Bahain, 2007; Liouville, 2007; Goubel, 2011; Guipert et al., 2011; Herisson, 2012; H erisson, et al., 2013; Rots, 2013
Biache-Saint-Vaast		IIbase	7	7e	5	ESR (US) on bone: 190 ± 17 ka (Bahain, 2007); 222 ± 27 ka (Bahain et al., 2015)	e	Lithostratigraphy, biochronology, terrace system	Primary	Yes	A	P	P	A	A	A	A	A	A	A	A	A	P	Flint	Marcy, 1985, 1986, 1988; Bouchet, 1986; Tuffreau, 1986, 1988a,b; Auguste, 1988, 1990, 1994, 1995a, 1995b, 2003, 2012; Tuffreau and Marcy, 1988; Leroy, 1990; Ameloot-Van der Heijden, 1991; Auguste and Patou-Mathis, 1994; Burie, 1996; Leblanc, 1999; Louguet, 2004, 2005; Bahain, 2007; Liouville, 2007; Goubel, 2011; Herisson, 2012; H erisson, et al., 2013
Biache-Saint-Vaast		E	7	7e or 7c-a	4	e	e	Lithostratigraphy, biochronology, terrace system	Primary	No	A	P	P	A	A	A	A	A	A	A	A	A	P	Flint	Ameloot-Van der Heijden, 1989, 1991; Auguste, 1994, 1995a, 1995b, 2003, 2012; Auguste and Patou-Mathis, 1994; Louguet, 2004, 2005; Goubel, 2011; Herisson, 2012
Biache-Saint-Vaast		D0	7	7e or 7c-a	4	ESR (US) on bone: 139 ± 27 ka (Bahain, 2007); 138 ± 28 ka (Bahain et al., 2015)	e	Lithostratigraphy, biochronology, terrace system	Primary	No	A	P	P	A	A	A	A	A	A	A	A	A	P	Flint	Ameloot-Van der Heijden, 1989, 1991; Auguste, 1994, 1995a, 1995b, 2003, 2012; Auguste and Patou-Mathis, 1994; Louguet, 2004, 2005; Bahain, 2007; Liouville, 2007; Goubel, 2011; Herisson, 2012
Abbeville	Route de Paris/rue de l'Abreuvoir		7	e	3	e	In progress	Terrace stratigraphy, lithostratigraphy, biochronology	Primary	Yes?	P	A	P	A	A	A	A	A	A	A	A	A	A	Flint	Locht et al., 2013
Drucat		e	7	e	3	e	e	Lithostratigraphy, terrace system	Primary	No	A	A	P	A	A	A	A	A	A	A	A	A	A	Flint	Locht and Kiefer, 2009; Locht et al., 2013
Etricourt-Manancourt	Secteur 2	LRS	7	7c-a	5	e	In progress	Lithostratigraphy	Primary	Yes	A	A	P	A	A	A	A	A	P	A	A	A	P	Flint	Herisson and Goval, 2013; H erisson et al., 2015; Herisson et al., 2016
Etricourt-Manancourt	Secteur 2	LGS	7	Late 7a	5	e	In progress	Lithostratigraphy	Primary	Yes	A	A	P	A	A	A	A	A	A	A	A	A	P	Flint	Herisson and Goval, 2013; H erisson et al., 2015; Herisson et al., 2016
Therdonne		N3	7	Late 7a	5	TL on burnt flint: 178 ± 11 ka (Locht et al., 2010; Herisson, 2012)	e	Lithostratigraphy	Primary	Yes	A	P	P	A	A	A	A	P	P	A	A	A	P	Flint	Locht et al., 2000; Gadebois, 2006; Locht et al., 2010; Herisson, 2012; Coudenneau, 2013; Herisson et al., 2013; H erisson and Locht, 2014
Montieres-l es-Amiens	Boutmy-Muchembled quarry	-	7	Late 7a?	4	e	ESR on quartz: 200 ± 57 ka (Laurent, 1993)	Lithostratigraphy, terrace system	?	No	A	P	P	A	A	A	A	P	A	A	A	A	P	Flint	Comment, 1912; Tuffreau et al., 1981; Tuffreau, 1983; Bordes, 1984; Antoine, 1990; Soriano, 2000
Maisons-Alfort			7/6		3	U/Th on bone: 162 ± 9 ka; 206.5 þ 17.8/15.2;	e	Lithostratigraphy	Secondary	No	A	P	P	A	A	A	A	A	A	A	A	A	A	Flint	Durbet et al., 1997; Hadjouis, 1998

				Late 7a/ early 6		190 þ 120/74 ka ¼> average 186 ± 23 ka (Durbet et al., 1997)																			
Biache-Saint-Vaast		D1	6	Early 6	4	e	e	Lithostratigraphy, biochronology, terrace system	Primary-Secondary	No	A	P	P	A	A	A	A	A	A	A	A	A	P	Flint	Marcy, 1984, 1985, 1986; Bouchet, 1986; Auguste, 1988, 1994, 1995a, 1995b, 2003, 2012; Marcy and Tuffreau, 1988b; Tuffreau, 1988a,b; Leroy, 1990; Ameloot-Van der Heijden, 1991; Auguste and Patou-Mathis, 1994; Burie, 1996; Louguet, 2004, 2005; Liouville, 2007; Goubel, 2011; Herisson, 2012
Biache-Saint-Vaast		D	6	Early 6	4	e	e	Lithostratigraphy, biochronology, terrace system	Primary-Secondary	No	A	P	P	A	A	A	A	A	A	A	A	A	P	Flint	Marcy, 1984, 1985, 1986; Bouchet, 1986; Auguste, 1988, 1994, 1995a, 1995b, 2003, 2012; Marcy and Tuffreau, 1988a; Tuffreau, 1988a; Ameloot-Van der Heijden 1991; Auguste and Patou-Mathis, 1994; Burie, 1996; Louguet, 2004, 2005; Liouville, 2007; Goubel, 2011; Herisson, 2012
Plachy-Buyon		N2	6	Early 6?	4	e	e	Lithostratigraphy	Primary	No	A	A	P	A	A	A	A	A	P	A	A	A	P	Flint	Locht et al., 1995
Plachy-Buyon		N1	6	Middle 6?	4	e	e	Lithostratigraphy	Primary	No	A	A	P	A	A	A	A	A	P	A	A	A	P	Flint	Locht et al., 1995
Gigny	Baume de Gigny	XXI	6	e	3	e	U/Th on speleothem: 145 þ 18/15 ka; RPE on speleothem: 145 þ 66/45 ka (Campy and Vuillemey, 1989)	Lithostratigraphy	Primary?	No	A	A	P?	A	A	P	A	A	A	A	A	A	A	Siliceous stone	Campy and Vuillemey, 1989
Achenheim		sol 74	6	e	3	e	e	Lithostratigraphy, biochronology	?	?	A	P	P	A	P	A	A	A	A	A	A	A	A	Siliceous stone	Heim et al., 1982; Lautridou et al., 1985; Junkmanns, 1995
Havrincourt 2	Les Bosquets	J	6	Late 6	5	e	OSL in progress	Lithostratigraphy	Primary	Yes	A	P	P	A	A	A	A	A	A	A	A	A	A	Flint	Goval and Herisson, 2012; Goval dir., 2013; Herisson and Goval, 2013
Ailly-sur-Noye		N3	6/5	Late 6/ early 5e	5	e	e	Lithostratigraphy, biochronology	Primary	Yes	A	P	P	A	A	A	A	A	A	A	A	A	P	Flint	Blondiau dir., 2009; Locht et al., 2013
Achenheim		Sol 81	9?	e	2	e	e	Lithostratigraphy, biochronology	Secondary	No	A	P	A	P	A	A	A	A	A	P	A	A	A	Siliceous stone	Heim et al., 1982; Lautridou et al., 1985; Junkmanns, 1995
Argoeuves		Serie grisatre^	8	e	2	e	e	Lithostratigraphy, terrace system	?	?	A	A	P	A	A	A	A	A	A	A	A	A	P	Flint	Breuil, 1913; Bourdier, 1969; Bourdier et al., 1974; Agache, 1976; Tuffreau, 1979; Tuffreau et al., 1981; Antoine, 1990; Soriano, 2000
Argoeuves		Serie roussatre^	8	e	2	e	e	Lithostratigraphy, terrace system	?	?	A	A	P	A	A	A	A	A	A	A	A	A	P	Flint	Breuil, 1913; Bourdier, 1969; Bourdier et al., 1974; Agache, 1976; Tuffreau, 1979; Tuffreau et al., 1981; Antoine, 1990; Soriano, 2000
Gouzeaucourt		H	8 or older	e	2	e	e	Lithostratigraphy	Secondary	No	A	A	A	A	P	A	A	A	A	P	A	A	P	Flint	Tuffreau and Bouchet, 1985; Marcy, 1989; Tuffreau et al., 1989; Tuffreau, 1992; Lamotte, 1995; Soriano, 2000
Gouzeaucourt		G	8 or e older		2	e	e	Lithostratigraphy	Secondary	No	A	A	A	A	P	A	A	A	A	P	A	A	P	Flint	Tuffreau and Bouchet, 1985; Marcy 1989; Tuffreau et al., 1989; Tuffreau, 1992; Lamotte, 1995; Soriano, 2000
Gentelles		CLG	8?	e	2	e	e	Lithostratigraphy	Secondary	No	A	P	P	P	P	A	A	A	P	P	A	A	P	Flint	Tuffreau et al., 2001; Balescu and Tuffreau, 2004; Goval, 2005; Tuffreau et al., 2008
Salouel		1974	8/7	8/ early 7?	Late2	e	e	Lithostratigraphy, terrace system	Secondary	No	A	A	P	A	A	A	A	A	A	A	A	A	P	Flint	Antoine, 1990; Ameloot-Van der Heijden, 1991; Ameloot-Van der Heijden et al., 1996
Salouel		1976	8/7	8/ early 7?	Late2	e	e	Lithostratigraphy, terrace system	Secondary	No	A	A	P	A	A	A	A	A	A	A	A	A	P	Flint	Antoine, 1990; Ameloot-Van der Heijden, 1991; Ameloot-Van der Heijden et al., 1996
Gentelles		LBP	7?	e	2	e	e	Lithostratigraphy	Secondary	No	A	A	A	A	P	A	A	A	A	A	A	A	P	Flint	Tuffreau et al., 2001; Balescu and Tuffreau 2004; Goval, 2005; Tuffreau et al., 2008
Bapaume	Les-Osiers	Serie B	7/6?	Late 7a/ early 6?	2	e	Relative TL (Mfe) on loess (Balescu and Tuffreau, 2004)	Lithostratigraphy, relative TL (Mfe)	Secondary	No	A	A	P	A	P	A	A	P	P	A	A	A	P	Flint	Tuffreau, 1971; Tuffreau, 1976; Tuffreau, 1979; Tuffreau, 1987; Balescu and Tuffreau, 2004; Koehler, 2008, 2011
Riencourt-les-Bapaume		Serie III	7 or e 6?		1	e	e	Lithostratigraphy	Secondary	No	A	A	A	A	P	A	A	A	A	A	A	P	A	Flint	Tuffreau dir., 1993
Gentelles		LGC	6?	e	2	e	IRSL on alcalin feldspaths: 194 ± 21 ka (Balescu and Tuffreau, 2004)	Lithostratigraphy	Secondary	No	A	P	A	A	P	A	A	A	A	A	A	A	P	Flint	Tuffreau et al., 2001; Balescu and Tuffreau, 2004; Goval, 2005; Tuffreau et al., 2008
Champvoisy		-	8 or 6?	Early 8 or early 6?	2	e	Relative TL (Mfe) on loess (Balescu, 1988; Balescu and Tuffreau, 2004)	Lithostratigraphy, relative TL (Mfe)	Secondary	No	A	A	P	A	A	A	A	A	A	A	A	A	A	Flint	Chertier and, Hinout, 1988; Tuffreau, 1989; Balescu, 1988; Balescu and Tuffreau, 2004
Saint-Acheul	Atelier Commont e carriere Bultel-Tellier	-	8-6	e	2	e	e	Lithostratigraphy	?	?	A	A	A	A	P	A	A	A	A	A	A	P	A	Flint	Commont, 1909, 1911; Bordes and Fitte, 1953; Tuffreau and Fagnart, 1986
Bagarre		Couche 10	8-6	e	1	e	e	Lithostratigraphy	Secondary	No	A	A	P	A	A	A	A	A	A	A	A	A	P	Flint	Tuffreau et al., 1975; Tuffreau et al., 1981; Boeda, 1994€
Bagarre		Couche 7	8-6	e	1	e	e	Lithostratigraphy	Secondary	No	A	A	P	A	A	A	A	A	A	A	A	A	P	Flint	Tuffreau et al., 1975; Tuffreau et al., 1981; Boeda, 1994€
Bagarre		Couche 5	8-6	e	1	e	e	Lithostratigraphy	Secondary	No	A	A	A	A	A	A	A	A	A	P	A	P	A	Flint	Tuffreau et al., 1975; Tuffreau et al., 1981; Boeda, 1994€
Longavesnes		e	8-6	e	1	e	e	Lithostratigraphy	Secondary	No	A	A	A	A	P	A	A	A	A	P	A	A	A	Flint	Tuffreau et al., 1989; Ameloot-Van der Heijden, 1991; Ameloot-Van de Heijden, 1993
Beaumetz-les-Loges		Serie	8-6	e	1 lustree	e	e	Lithostratigraphy	Secondary	No	A	A	P?	A	A	A	A	A	A	A	A	A	P	Flint	Hurtrelle et al., 1972; Tuffreau, 1974; Somme and Tuffreau, 1976; Tuffreau, 1987
Beaumetz-les-Loges		Serie	8-6	e	1 jaune	e	e	Lithostratigraphy	Secondary	No	A	A	A	A	P	A	A	A	A	A	A	P	A	Flint	Hurtrelle et al., 1972; Tuffreau 1974; Somme and Tuffreau, 1976; Tuffreau, 1987
Tillet		Serie	8-6	e	1 blanche	e	e	Lithostratigraphy	Secondary	No	A	A	P	A	P	A	A	A	A	A	A	A	A	Flint	De Givenchy, 1911; Bordes, 1954
Tillet		Serie	8-6	e	1 grise	e	e	Lithostratigraphy	Secondary?	No	A	A	P	A	A	A	A	A	A	A	A	A	A	Flint	De Givenchy, 1911; Bordes, 1954
Vimy		e	8-6	e	1	e	e	Lithostratigraphy	Secondary	No	A	A	P	A	P	A	A	A	A	A	A	A	P	Flint	Somme and Tuffreau, 1976; Tuffreau, 1974; Tuffreau, 1979

Table 6
Data of North-west French sites from MIS 9 to 6, mapped in Fig. 6. Sites with a secure MIS correlation (index 3, 4 and 5; cf. Section 3) are in bold, sites with an uncertain MIS correlation (index 0, 1 and 2; cf. Section 3) are in italics.

Site	Precise location	Level/Layer	MIS	Precise MIS	Value of MIS correlation (x/5)	Direct dating	Indirect dating	Relative chronology	Context	Spatial integrity	Human remains	Faunal remains	Levallois	Pebble tools	"Acheulean" biface	"Mousterian" biface	Trifacial shaping		Discoid	SSDA			Others	material	Bibliography
Gatteville	Plateforme III	Sables dunaires roux	9	e	4	e	e	Lithostratigraphy	Secondary	No	A	A	A	A	P	A	A	A	A	A	A	A	A	Flint	Coutard and Cliquet, 2005
Barneville	Carrefour Boudet	Sable blanchi	9?	e	3	e	In progress	Lithostratigraphy	?	No	A	A	P	P	A	A	A	A	A	P	A	P	A	Schiste, quartzite, flint	Cliquet dir., 2008
Le Pucheuil		A/C	8/7	Late 8/ early 7?	3	e	e	Lithostratigraphy	Secondary	No	A	A	P	A	A	A	A	A	A	A	A	A	P	Flint	Delagnes, 1993; Delagnes and Ropars dir., 1996
Ranville	Carriere Calcia	Ensemble A	7	e	4	RPE & UeTh on teeth: between 205 and 235 ka (Bahain et al. in Cliquet dir., 2008)	e	e	Secondary	No	A	P	A	P	A	A	A	A	A	A	A	P	A	Flint	Cliquet dir., 2008
Ranville	Carriere Calcia	Ensemble B	7	e	4	RPE & UeTh on teeth: between 205 and 235 ka (Bahain et al. in Cliquet dir., 2008)	e	e	Secondary	No	A	P	A	P	P	A	A	A	A	A	A	P	A	Flint	Cliquet dir., 2008
SaintGermaindes-Vaux	La Roche Gel etan	Paleoplage	7	e	4	TL on burnt flint: 207 ± 16 ka; 214 ± 17ka (Cliquet et al., 2003)	e	Lithostratigraphy	Secondary	No	A	A	P	P	P?	A	A	A	A	P	A	A	P	Flint, quartz, sandstone	Michel, 1994; Cliquet et al., 2003; Cliquet and Lautridou, 2009
Jobourg	Ecalgrain	Sables rouges	7	7c-a	5	e	IRSL: 190 ± 19 ka (Cliquet et al., 2009a,b)	Lithostratigraphy	Primary	No	A	A	P	A	A	A	A	A	P	P	A	A	A	Flint	Cliquet et al., 2009a
Fermanville	Port-Pignot	Sables roux	7	7c-a?	4	e	e	Lithostratigraphy	Primary	No	A	A	P	P	P	P	A	A	A	P	A	A	A	Flint, quartz, sandstone	Michel et al., 1982; Coutard and Cliquet, 2005
Equeurdreville	La Saline	Sables jaunes	7	7c-a?	3	e	IRSL in progress	Lithostratigraphy	Secondary	No	A	A	P?	P	P	A	A	A	A	A	A	A	A	Flint	Cliquet and Lautridou, 2009
Grossoeuvre	Le vieux-Moulin	cailloutis de base 7?		e	3	TL on burnt flint: 220 ± 12 ka (Cliquet et al., 2003)	e	Lithostratigraphy	Secondary	No	A	A	P	A	A	P	A	A	A	A	A	A	A	Flint	Cliquet et al., 2003
Tourville-la-Riviere	La Fosse-Marmitaine	D1	7	Late 7a	5	ESR in progress	TL on alkali feldspars: 198 ± 26 ka (Balescu et al., 1997); IRSL on alkali feldspars: 196 ± 23 ka (Balescu et al., 1997) and in progress	Lithostratigraphy, biochronology, terrace system	Secondary	No	A	P	P	A	A	A	A	P	A	A	A	P	A	Flint	Stremme, 1985; Vallin, 1991; Guilbaud and Carpentier, 1995; Balescu et al., 1997; Lautridou et al., 2003; Cordy et al., 2003; Cliquet dir., 2010
Tourville-la-Riviere	La Fosse-Marmitaine	D2	7/6	Late 7a/ early 6	4	ESR-US & CS-US: 183 to 226 ka (Faivre et al., 2014)	In progress	Lithostratigraphy, biochronology, terrace system	Primary	Yes	P	P	P	A	A	A	A	A	A	A	A	P	A	Flint	Stremme, 1985; Vallin, 1991; Balescu et al., 1997; Lautridou et al., 2003; Cordy et al., 2003; Cliquet dir., 2010
Tourville-la-Riviere	La Fosse-Marmitaine	D3	7/6	Late 7a/ early 6	4	ESR in progress	In progress	Lithostratigraphy, biochronology, terrace system	Primary	Yes	A	P	P	A	A	A	A	A	A	A	A	P	A	Flint	Stremme, 1985; Vallin, 1991; Balescu et al., 1997; Lautridou et al., 2003; Cordy et al., 2003; Cliquet dir., 2010
Pleneuf e Val-Andre	Piegu	D-G	7/6	e	3	ESR-U/Th & RPE on teeth (level G): 193 ± 6 ka (Bahain et al., 2012)	In progress	Lithostratigraphy	Secondary	No	A	A	P	A	A	A	A	A	A	A	A	A	A	Flint	Monnier, 1976, 1985; Bahain et al., 2012
Le Pucheuil		B	7/6	Late 7a/ early 6	3	e	e	Lithostratigraphy	Secondary	No	A	A	P	A	P	A	A	A	A	A	A	A	P	Flint	Delagnes, 1993; Delagnes and Ropars dir., 1996
Gouberville	La Lande du Nau	Sable limonoargileux grisjaune	6	e	5	TL on burnt flint: between 187 ± 26 and 128 ± 20 ka (Cliquet et al., 2003)	e	Lithostratigraphy	Primary	No	A	A	P	A	A	A	A	A	A	A	A	A	A	Flint, sandstone	Cliquet et al., 2003; Coutard and Cliquet, 2005
Saint-Germaindes-Vaux	La Roche Gel etan	Heads	6	e	4	TL on burnt flint: 149 ± 11 ka (Cliquet et al., 2003)	e	Lithostratigraphy	Primary	No	A	A	P	P	P	P	A	A	A	P	A	A	P	Flint, quartz, sandstone	Michel, 1994; Cliquet et al., 2003; Cliquet and Lautridou 2009
Pleneuf e Val-Andre	Les Vallees	L.21	6	e	4	ESR on bone: 182 ± 29 ka, 138 ± 22 ka, 163 ± 23 ka (Bahain et al., 2012)	e	Lithostratigraphy	?	No	A	P	A	A	A	A	A	A	A	A	A	P	A	Quartz	Monnier et al., 2011; Bahain et al., 2012
Le Long Buisson	Guichainville, Le LongBuisson I, Zone 5, second dolina	Serie blanche	6	e	3	e	e	Lithostratigraphy	Primary	No	A	A	P	A	P?	A	A	A	P	A	A	P	P	Flint	Cliquet dir., 2013; Cliquet, 2013
Nantois		Layer 35	6	e	3	ESR-U on bone: 166 ± 8 ka (Bahain et al., 2012)	In progress	Lithostratigraphy	Secondary	No	A	P	P	A	A	A	A	A	A	A	A	A	A	Flint	Monnier et al., 1986; Bahain et al., 2012
Saint-Suliac	Grainfollet	Grainfollet	6	e	3	ESR on bones: 168 ± 18 ka; 171 ± 5 ka (Bahain in Laforge, 2012 and Laforge et al., 2014)	e	Lithostratigraphy	Primary	Yes	A	P	P	A	P?	A	A	A	A	A	A	A	A	Flint	Giot and Bordes, 1955; Monnier, 1980; Laforge, 2012; Laforge et al., 2014
Tancarville			6?	e	3	e	e	Lithostratigraphy	Secondary	No	A	A	P	A	A	A	A	A	A	A	A	A	A	Flint	Lebret et al., 1984; Cordy et al., 2003
Bonneval		N5	9	e	2	e	Re-OSL: between 273 ± 26 ka (layer 7) and 374 ± 31 ka (layer 8) (Sun et al., 2010)	Lithostratigraphy	Secondary	No	A	A	A	A	P	A	A	A	P	A	A	A	P	Flint	Sun et al., 2010
Digulleville	Jardeheu	Plage « superieure »	7/ 6?	Late 7a/ early 6	2	e	e	Lithostratigraphy	Secondary	No	A	A	P	P	P	A	A	A	A	A	A	A	A	Granite, diorite, aplite, dolerite	Coutard et al., 2002; Cliquet dir., 2008
Saint-Bricesous-Ranes^	La Bruyere	Cailloutis de base	6	e	2	TL on burnt flint: 143 ± 12 ka (Cliquet et al., 2009b)	e	Lithostratigraphy	Secondary	No	A	A	P	A	A	P	A	A	A	A	A	A	A	Flint	Cliquet et al., 2009b
Les Gastines	Saint-Pere-Marc-en Poulet		6	e	2	e	e	Lithostratigraphy	Secondary	No	A	A	P	A	A	A	A	A	A	A	A	A	A	Flint	Monnier, 1988
Montfarville	La Houe		7-6?	e	1	e	e	e	Secondary	No	A	A	P	A	A	P	A	A	P	A	P	P	A	Flint	Coutard and Cliquet, 2005
Saint-Martin-Osmonville	La Salle	NA	6?	e	1	e	e	Lithostratigraphy	Secondary	No	A	A	P	A	A	A	A	A	A	A	A	A	A	Flint	Michel, 1982

Mauquenchy	Le Fond de Randillon	N3	8-6 e	1	e	e	Lithostratigraphy	Secondary No	A	A	P	A	P	A	A	A	A	A	A	A	A	Flint	Locht et al., 2013
Le Long Buisson	Guichainville, Le Long-Buisson I, Zone 5 et 6	Serie marron	6- e 5?	1	e	e	Lithostratigraphy	Secondary No	A	A	P	A	A	P?	A	P	A	A	A	P	A	Flint	Cliquet dir., 2013; Cliquet, 2013

Table 7
Data of South-east French sites from MIS 9 to 6, mapped in Fig. 7. Sites with a secure MIS correlation (index 3, 4 and 5; cf. Section 3) are in bold, sites with an uncertain MIS correlation (index 0, 1 and 2; cf. Section 3) are in italics.

Site	Exact location	Level/ Layer	MIS	Precise MIS	Value of MIS correlation (x/5)	Direct dating	Indirect dating	Relative chronology	Context integrity	Spatial	Human remains	Faunal remains	Levallois	Pebble tools	"Acheulean" biface	"Mousterian" biface	Trifacial shaping	Discoid	M	SSDA		Others	M	material	Bibliography
Orgnac 3	Orgnac l'aven	6	9	Late 9	4	ESR on teeth: 362 ± 51 ka (Bahain et al., 2012); ESR on bone: 400 ± 54 ka (Bahain et al., 2012)	ESR/UeTh on speleothem: 255e319 ka (Michel et al., 2011); ESR on quartz: 501 ka and ESR on speleothem: 293e372 ka (Massaoudi, 1995); UeTh on speleothem: 339 ka and ESR on speleothem: 309 ± 34 ka (Falgueres et al., 1988)	Biostratigraphy	Primary	Yes	P	P	P	P	P	A	A	A	P	P	A	A	A	Flint	Moncel et al., 2011, 2012
Orgnac 3	Orgnac l'aven	5	9	Late 9	4	ESR on teeth: 111 ka and 161 ka (Massaoudi, 1995); ESR on teeth: 347 ± 65 ka/346 ± 37 ka (Bahain et al., 2012); ESR on bone: 346 ± 37 ka/ 379 ± 45 ka (Bahain et al., 2012)	ESR/UeTh on speleothem: 255e319 ka (Michel et al., 2011); ESR on quartz: 501 ka and ESR on speleothem: 293e372 ka (Massaoudi, 1995); UeTh on speleothem: 339 ka and ESR on speleothem: 309 ± 34 ka (Falgueres et al., 1988)	Biostratigraphy	Primary	Yes	P	P	P	P	P	A	A	A	P	P	A	A	A	Flint	Moncel et al., 2011, 2012
Orgnac 3	Orgnac l'aven	4a	9	Late 9	4	e	ESR on quartz: 375 ka (Massaoudi, 1995); ESR/UeTh on speleothem: 300e400 ka (Massaoudi, 1995)	Biostratigraphy	Primary	Yes	P	P	P	P	P	A	A	A	P	P	A	A	A	Flint	Moncel et al., 2011, 2012
Orgnac 3	Orgnac l'aven	3	9/8	Late 9early 8	4	e	e	Biostratigraphy	Primary	Yes	A	P	P	P	P	A	A	A	P	P	A	A	A	Flint	Moncel et al., 2011, 2012
Orgnac 3	Orgnac l'aven	2	9/8	Late 9early 8	4	e	Fission track dating FT on zircons: 298 ± 55 ka (Khatib, 1994); Ar/Ar on sanidines: 308.2 ± 6.8 ka (Michel et al., 2011); Volcanic minerals: 300 ka (Debard and Pastre, 1988)	Biostratigraphy	Primary	Yes	A	P	P	P	P	A	A	A	P	P	A	A	A	Flint	Moncel et al., 2011, 2012
Orgnac 3	Orgnac l'aven	1	9/8	Late 9early 8	4	ESR on teeth: 242 ka and 360 ka (Massaoudi, 1995)	e	Biostratigraphy	Primary	Yes	A	P	P	P	P	A	A	A	P	P	A	A	A	Flint	Moncel et al., 2011, 2012
Payre	Rompon	layer F	8/7	Late 8/ early 7	4	ESR/UeTh on teeth: 169 ± 13 ka, TL on flint: 232 ± 15 ka (Bahain, 2009)	ESR/UeTh on speleothem, TIMS on speleothem: 251 ± 25 ka (Valladas et al., 2008)	Biostratigraphy	Primary	Yes	P	P	P	P	P	A	A	P	P	P	A	A	A	Flint	Moncel dir. 2008; Valladas et al., 2008; Bahain, 2009
Payre	Rompon	layer G	8/7	Late 8/ early 7	4	ESR/U-Th on teeth: 235 ± 18 ka; TL on flint: 231 ± 27 ka (Bahain, 2009	ESR/UeTh on speleothem, TIMS on speleothem: 247 ± 27 ka (Valladas et al., 2008)	Biostratigraphy	Primary	Yes	P	P	A	P	P	A	A	P	P	P	P	A	A	Flint	Moncel dir. 2008; Valladas et al., 2008; Bahain, 2009
SainteAnne 1		J2	7	e	3	ESR/UeTh on teeth: 193 ± 22 ka (Raynal dir., 2013); in progress ESR/UeTh on teeth	e	Biostratigraphy	Primary	Yes	A	P	P	P	P	A	A	A	P	P	P	A	A	Flint and volcanic rock	Raynal dir., 2007; Santagata, 2012; Raynal et al., 2013
SainteAnne 1		J1	7/6	Late 7/ early 6	3	e	e	Biostratigraphy	Primary	Yes	A	P	P	P	P	A	A	A	P	P	P	A	A	Flint and volcanic rock	Raynal dir., 2007; Santagata 2012; Raynal et al., 2013

Lazaret	Nice	UA26	6	e	3	ESR on teeth: 126e205 ka (Michel et al., 2000, 2009)	ESR and UeTh on speleothem: 110 ka < Age <238 ka (Shen, 1985; Yokoyama et al., 1985; Falgueres et al., 1992 ; Bahain et al., 1993; Shen and Gahleb, 1995; Michel et al., 2009, 2011)	Biostratigraphy	Primary	Yes	P	P	P	P	P	A	A	A	P	A	A	A	P	Limestone/ flint	Valensi et al., 2013
Lazaret	Nice	UA25	6	6.3	3	ESR on teeth: 126e205 ka (Michel et al., 2000, 2009)	ESR and UeTh on speleothem: 110 ka < Age <238 ka (Shen, 1985; Yokoyama et al., 1985; Falgueres et al., 1992 ; Bahain et al., 1993; Shen and Gahleb, 1995; Michel et al., 2009, 2011)	Biostratigraphy	Primary	Yes	A	P	P	P	P	A	A	A	P	A	A	A	P	Limestone/ flint	De Lumley et al., 2004
Lazaret	Nice	ensemble III	6	6.2	4	ESR on teeth: 114e125 ka (Michel et al., 2000, 2009)	ESR and UeTh on speleothem: 110 ka < Age <238 ka (Shen, 1985; Yokoyama et al., 1985; Falgueres et al., 1992 ; Bahain et al., 1993; Shen and Gahleb, 1995; Michel et al., 2009, 2011)	Biostratigraphy	Primary	Yes	P	P	P	P	P	A	A	A	P	A	A	A	P	Limestone/ flint	Darlas, 1994
Payre	Rompon layer D		6/5	Late 6	4	ESR/UeTh on teeth: 144 ± 11 ka (Bahain, 2009)	ESR/UeTh on speleothem, TIMS on speleothem: 159 ± 10 ka (Valladas et al., 2008)	Biostratigraphy	Primary	Yes	P	P	A	P	P	A	A	P	P	P	A	A	A	Flint	Moncel, dir., 2008; Valladas et al., 2008; Bahain, 2009
Caune de l'Arago		unit IV level C	9-6?	e	2	e	ESR/UeTh on speleothem: 104e151 ka; 215e229 ka; 273e>350 ka (Falgueres et al., 2004)	Biostratigraphy	Primary	Yes	A	P	A	P	A	A	A	A	P	P	A	A	P	Quartz/ flint	Barsky, 2013
Baume Bonne		Phase 2	8/7	Late 8/ early 7	2	ESR/UeTh on teeth: 200 ka (Falgueres et al., 1993; Gagnepain, Gaillard, 2005)	e	Lithostratigraphy	Primary	Yes	A	P	P	P	P	A	A	A	P	P	A	A	P	Chert/flint	Gagnepain and Gaillard, 2005
Baume Bonne		Phase 3	6	e	2	ESR/UeTh on teeth: 150 ka (Falgueres et al., 1993; Gagnepain, Gaillard 2005)	e	Lithostratigraphy	Primary	Yes	A	P	P	P	P	A	A	A	P	P	A	A	P	Chert/flint	Gagnepain and Gaillard, 2005

Site	Precise location	Level/ Layer	MIS	Precise MIS	Value of MIS correlation (x/5)	Direct dating	Indirect dating	Relative chronology	Context	Spatial integrity	Human remains	Faunal remains	Levallois	Pebble tools	"Acheulean" biface	"Mousterian" biface	Trifacial shaping	Blade	Discoid	MPCR/ SSDA	Quina	PCT	Others	Main raw material	Bibliography
La Micoque		L2-3	9-8	e	3	ESR on teeth: 332 to 291 ka (Falgueres et al., 1997)	e	e	Secondary	No	A	P	A	A	A	A	P	A	A	P	A	A	P	Flint	Boeda, 1991; Delpech et al., 1995; Falgu€ eres et al., 1997; Guibert et al., 2008
Petit-Bost		2	9-8	e	5	TL on burnt flint: 248 ± 31 ka; 312 ± 23 ka; 338 ± 43 ka e (Guibert et al., 2006; Bourguignon et al., 2008)		e	Secondary	No	A	A	P	A	P	P	A	A	P	A	P	A	P	Flint	Lahaye, 2005; Lahaye et al., 2006; Guibert et al., 2006; Bourguignon et al., 2008
Les Bosses			8	e	3	TL on burnt flint: 250e300 ka; 291 ± 31 (mean 5TL) (Jarry e e et al., 2007)			Secondary	No	A	A	P	P	P	A	A	A	P	A	A	A	A	Quartz	Jarry et al., 2004, 2007; Jarry, 2010
Pech de l'Aze II		c9	8?	e	3	ESR-EU on teeth: 131 ± 17 ka; ESR-LU: 174.8 ± 22.5 ka e (Grün and Stringer, 1991)		e	Primary	No	A	P	A	P	A	A	P	A	A	A	A	A	A	Flint	Bordes, 1971, 1972, 1984; Boeda, 1991; Grün€ and Stringer, 1991; Delepch et al., 1995
Pech de l'Aze II		c8	8?	e	3	ESR-EU on teeth: 152.5 ± 16.7 ka; ESR-LU: 194.7 ± 19.7 ka e (Grün and Stringer, 1991)		e	Primary	No	A	P	A	P	A	A	P	A	A	A	A	A	A	Flint	Bordes, 1971, 1972, 1984; Boeda, 1991; Grün€ and Stringer, 1991; Delpech and Prat, 1995
Combe Brune 2	Creysse	VIII	8/7	e	5	OSL: 246 ± 8 ka (unpublished, com. Brenet)	After other stratigraphic limit with TL and OSL: 220 < d < 195 ± 16 ka (Brenet, 2011)	e	Primary	No	A	A	P	A	P	A	P	P	P	P	A	A	A	Flint	Brenet, 2011, 2013; Frouin et al., 2014
Vaufrey	Cenac et Saint Julien	X	8/7	e	3	e U/Th on speleothems: 246 ka (Blackwell and Schwarcz e in Rigaud dir., 1988)			Primary	No	A	P	A	P	P	A	A	A	P	A	A	A	A	Flint	Geneste 1985, 1988; Rigaud dir., 1988; Hernandez et al., 2014
Vaufrey	Cenac et Saint Julien	IX	7	Middle 7	3	e	U/Th on speleothems: 208 ± 8 ka (Blackwell and Schwarcz in Rigaud dir., 1988)	e	Primary	No	A	P	P	P	A	A	A	A	A	A	A	A	A	Flint	Geneste 1985, 1988; Rigaud dir., 1988; Hernandez et al., 2014
Barbas I	Creysse	C′4	7	Middle 7	5	TL on burnt flint: 239 ± 44 ka (Valladas et al., 1999)	e	e	Primary	Yes	A	A	A	A	A	A	P	A	A	A	A	A	A	Flint	Boeda, 1991, 2001; Bo€ eda et al., 1996, 2004;€ Valladas et al., 1999; Chevrier, 2006
Cantalouette 1	Creysse	V	7	Middle 7	5	TL on burnt flint: 222.9 ± 20.1 ka (Guibert and Vieillevigne e in Brenet et al. 2008)		e	Primary	No	A	A	P	P	P	A	A	A	A	A	A	A	A	Flint	Vieillevigne et al., 2008; Brenet et al., 2008; Brenet, 2011, 2013
Pech de l'Aze II		c7	7	e	3	ESR-EU on teeth: 156.7 ± 15.1ka; ESR-LU: 193.8 ± 19.1 ka e (Grün and Stringer, 1991)		e	Primary	No	A	P	P	P	P	A	P	A	A	A	A	A	A	Flint	Bordes, 1971, 1972, 1984; Boeda, 1991;€ Delpech et al., 1995
Combe Brune 2	Creysse	X	7	Late 7	4	TL on burnt flint: 195 ± 16 ka (Lahaye in Brenet et al., 2008) e		e	Primary	No	A	A	P	P	P	A	P	P	P	A	A	A	Combined: flaking and shaping	Flint	Brenet, 2011, 2013; Frouin et al., 2014
Cantalouette 1	Creysse	IVb	7-6	e	3	e	After other stratigraphic limit: with TL and OSL: 165 ± 13 < d < 222.9 ± 20.1 ka (Brenet, 2011)	Lithostratigraphy	Secondary	No	A	A	P	A	P	A	A	A	A	A	A	A	A	Flint	Brenet et al., 2008; Brenet, 2011, 2013
Petit-Bost		1	7 or 6	e	3	e	e	Lithostratigraphy	Secondary	No	A	A	P	A	A	P	A	A	A	A	A	A	P	Flint	Lahaye, 2005; Lahaye et al., 2006; Guibert et al., 2006; Bourguignon et al., 2008
Combe Brune 2	Creysse	VIIb	6	Early 6	4	TL on burnt flint: 187 ± 21 ka (Lahaye in Brenet et al., 2008) e		e	Secondary	No	A	A	P	A	P	A	A	P	P	P	A	A	A	Flint	Brenet, 2008 2011, 2013; Frouin et al., 2014
Combe Brune 2	Creysse	VIIa	6	Early 6	4	e	After other stratigraphic limit: with TL and OSL: 185 ± 23 < d < 195 ± 16 ka (Brenet, 2011)	Lithostratigraphy	Primary	No	A	A	P	P	P	A	P	P	P	P	A	A	Combined: flaking and shaping	Flint	Brenet, 2011, 2013; Frouin et al., 2014
Combe Brune 2	Creysse	VI	6	Early 6	4	TL on burnt flint: 185 ± 23 ka (Lahaye in Brenet et al., 2008) e		e	Primary	No	A	A	P	A	P	A	A	P	P	P	A	A	A	Flint	Brenet, 2008 2011, 2013; Frouin et al., 2014
Combe Brune 2	Creysse	V	6	Early 6	4	TL on burnt flint: 183 ± 20 ka (Lahaye in Brenet et al., 2008) e		e	Primary	No	A	A	P	A	A	A	A	P	A	P	A	A	A	Flint	Brenet, 2008 2011, 2013; Frouin et al., 2014
Combe Brune 2	Creysse	II	6	Early 6	4	e	After other stratigraphic limit: with TL and OSL: 173 ± 9 ka < age < 183 ± 20 ka (Brenet, 2011)	e	Primary	No	A	A	P	A	A	A	A	P	P	A	A	A	A	Flint	Brenet, 2011, 2013; Frouin et al., 2014
Barbas I	Creysse	C′3base	6	Middle 6	5	TL on burnt flint: 146 ± 29 ka, 147 ± 28 ka (Valladas et al., e 1999)		e	Primary	Yes	A	A	A	A	A	P	A	A	A	A	A	A	A	Flint	Boeda, 1991, 2001; Bo€ eda et al., 1996, 2004;€ Valladas et al., 1999
Cantalouette 2	Creysse	Base (Grain de sel)	6	Middle 6	3	TL on burnt flint: 165 ± 13 ka (Vieillevigne et al. 2008; e Guibert et al. 2008)		e	Primary	No	A	A	P	A	A	A	A	A	A	A	A	A	P	Flint	Bourguignon et al., 2008
Combe Brune 3	Creysse	I	6	Middle 6	4	TL on burnt flint: 156 ± 12 ka (Viellevigne in Brenet et al., e 2008)		e	Secondary	No	A	A	A	A	P	A	P	A	A	P	A	A	Combined: flaking and shaping	Flint	Brenet et al., 2008; Brenet, 2011, 2013
Pech de l'Aze II		c6	6	e	3	RPE on teeth: 162e130 ka; ESR-LU: 188.4 ± 22.2 ka (Grün e and Stringer, 1991)		e	Primary	No	A	P	P?	P?	A	A	P	A	A	A	A	A	A	Flint	Bordes, 1971, 1972, 1984; Boeda, 1991;€ Delpech and Prat, 1995
Pech de l'Aze II		c5	6	Middle 6	3	RPE on teeth: 146e128 ka; ESR-LU: 171.6 ± 18.7 ka (Grün e and Stringer, 1991)		e	Primary	No	A	P	P	P	A	A	A	A	A	A	A	A	A	Flint	Bordes 1971, 1972, 1984; Boeda 1991;€ Delpech and Prat, 1995
Vaufrey	Cenac et Saint Julien	VIII	6	Middle 6	3	e	U/Th on speleothems: 142 þ 130/-68 ka (Blackwell and Schwarcz in Rigaud dir., 1988)	e	Primary	No	A	P	P	P	A	A	A	P	A	A	A	A	A	Flint	Geneste 1985, 1988; Rigaud dir., 1988; Hernandez et al., 2014
Combe Grenal		54	6	e	3	e	e	Biochronology	Primary	No	A	P	P	A	P	A	P	A	P	A	A	A	P	Flint	Bordes, 1955, 1971, 1972, 1984; Bordes and Prat, 1965; Bordes et al., 1966; Turq, 1992; Delpech and Prat, 1995; Turq et al., 2010
Combe Grenal		56	6	e	3	e	e	Biochronology	Primary	No	A	P	P	A	P	A	P	A	P	A	A	A	P	Flint	Bordes 1955, 1971, 1972, 1984; Bordes and Prat, 1965; Bordes et al., 1966; Turq 1992; Delpech and Prat, 1995; Turq et al., 2010

Table 8 Data of South-west French sites from MIS 9 to 6, mapped in Fig. 8. Sites with a secure MIS

257 e 258

Abri Suard	La Chaise-	53 de-Vouthon	6	e	4	e	U/Th on speleothems: 185 ± 30 ka (Schwarcz and Debenath, 1979)	e	Primary	?	A	P	P	P	A	A	A	A	A	A	A	A	A	Flint	Debenath, 1974a,b; Blackwell et al., 1983; Delagnes, 1992a,b
Abri Suard	La Chaise-	52 de-Vouthon	6	e	4	e	e	e	Primary	?	A	P	P	P	A	A	A	A	A	A	A	A	A	Flint	Debenath, 1974a,b; Blackwell et al., 1983; Delagnes, 1992a,b
Abri Suard	La Chaise-	51 de-Vouthon	6	e	4	TL: 126 ± 15 ka (Schvoerer et al., 1977)	e	e	Primary	?	A	P	P	P	A	P	A	A	A	A	A	A	A	Flint	Debenath, 1974a,b; Blackwell et al., 1983; Delagnes, 1990,1992a,b
Abri Suard	La Chaise-	50 de-Vouthon	6	e	4	e	e	e	Primary	?	A	P	P	P	A	A	A	A	A	A	A	A	A	Flint	Debenath, 1974a,b; Blackwell et al., 1983; Delagnes, 1992a,b
Coudoulous I		Niv. inf.	6	e	3	ESR on teeth: 200e130 ka (Jaubert et al., 2005)	U/Th on speleothems: 200e130 ka (Jaubert et al., 2005)	Biochronology	Primary	No	A	P	P	P	P	A	A	A	P	A	A	A	P	Quartz	Jaubert et al., 2005
La Borde	Livernon		6	e	3	e	e	Biochronology	Primary	Yes	A	P	P	A	A	A	A	A	P	A	A	A	P	Quartz	Jaubert et al., 1990
Vaufrey	Cenac et Saint Julien	IV	6	Late 6	3	TL on burnt flint: 123 to 140 ka (Huxtable and Aitken in Rigaud dir., 1988)	e	e	Primary	No	A	P	P	P	P	A	A	A	A	A	A	A	A	Flint	Geneste, 1985, 1988; Rigaud dir., 1988; Hernandez, et al., 2014
Vaufrey	Cenac et Saint Julien	V	6	Late 6	3	e	e	Lithostratigraphy	Primary	No	A	P	P	P	A	A	A	A	A	A	A	A	A	Flint	Geneste, 1985, 1988; Rigaud dir., 1988; Hernandez et al., 2014
Vaufrey	Cenac et Saint Julien	VI	6	Late 6	3	e	e	Lithostratigraphy	Primary	No	A	P	P	P	A	A	A	P	A	A	A	A	A	Flint	Geneste, 1985, 1988; Rigaud dir., 1988; Hernandez et al., 2014
Vaufrey	Cenac et Saint Julien	VII	6	Late 6	3	e	U/Th on speleothems: 168 ± 10 ka (Blackwell and Schwarcz in Rigaud dir., 1988)	e	Primary	No	A	P	P	P	A	A	A	P	A	A	A	A	A	Flint	Geneste, 1985, 1988; Rigaud dir., 1988; Hernandez et al., 2014
Croix de Canard	Neuvic	3	8-6?	e	2	e	e	Lithostratigraphy	Primary	No	A	A	P	A	A	A	A	A	A	A	A	A	A	Flint	Detrain et al., 2005
Les Pendus	Creysse		7 or 6	e	2	e	e	Lithostratigraphy	Secondary	No	A	A	A	P	A	A	P	A	A	P	A	A	A	Flint	Guichard and Guichard, 1966; Boeda, 1991,€ 2001; Garreau, 1998, 2000; Chevrier, 2006; Folgado et al., 2005
Les Tares		1	6?	Early 6?	1		After other stratigraphic limit: 150 ka < age <200 ka (Delpech and Prat, 1995)	Lithostratigraphy	Primary	No	A	A	A	P	A	A	A	A	A	P	A	A	P	Flint	Rigaud and Texier, 1981; Bertran and Texier, 1990; Delpech and Prat, 1995; Geneste and Plisson, 1996; Faivre et al., 2010
Coupe Gorge	Montmaurin		6	e	1	e	e	Lithostratigraphy	Primary	No	A	P	P	P	A	A	A	A	P	P	A	A	P	Quartzite/flint	Gaillard, 1982

correlation (index 3, 4 and 5; cf. Section 3) are in bold, sites with an uncertain MIS correlation (index 0, 1 and 2; cf. Section 3) are in italics.

Palaeolithic investigations in the Netherlands (Roebroeks, 1988; De Loecker, 2006)” (Verpoorte et al., 2016).

Excavations uncovered a total of eight archaeological findspots, together with a series of test pits and section finds (in total 1577 m^2). They represent several open-air site occupations (9 archaeological layers; Table 2). The Saalian lithic artefacts were recovered from two distinct major find levels (within local Unit IV), which are considered contemporaneous in Pleistocene terms (cf. Roebroeks, 1988, 133; De Loecker, 2006, 230): i.e. the lower Subunit IV-B (Sites B, C and G) and the upper Subunit IV-C-ß (Sites A, D, F, H, K and N). Terrace and loess stratigraphy, as well as the mammal and mollusc biostratigraphical evidence, indicate an intra-Saalian age, prior to MIS 6, for the archaeological levels (Van Kolfschoten and Roebroeks, 1985; van Kolfschoten et al., 1993). The latter, together with TL and ESR dating evidence, allows the reconstruction of a secure palaeoenvironmental and chronostratigraphic framework and correlates the Unit IV finddistributions with the intra-Saalian Belved ere-Interglacial, corresponding to the MIS 7 (243e191 ka, after Lisiecki and Raymo, 2005). However, amino acid racemization dating of Corbicula shells from the Interglacial deposits as well as elements of the mollusc fauna suggest an earlier, MIS 9, age for the Belved ere-Interglacial and its associated archaeology (Meijer and Cleveringa, 2009).

The investigation of extensive refitting programs, detailed technological and typological analyses, the study of spatial patterning, use-wear analyses, etc. give a very detailed behavioural sketch of the eight ‘scatters and patches’ (cf. Isaac, 1981a,b; Roebroeks et al., 1992; De Loecker, 2006; De Loecker and Roebroeks, 2012) which were preserved in primary archaeological contexts: i.e. a series of fine-grained sediments deposited by the Middle Pleistocene meandering river Maas during MIS 7 (or possibly MIS 9). Variations in the used core-approach are well documented at Belved ere: Sites F, H and K are domi- nated by a disc and/or discoidal core-approach, while at Site N and especially at Site C the presence of Levallois products is significant.

No Saalian human remains were discovered at Maastricht or elsewhere on the Dutch mainland. Faunal remains were present and preserved at Maastricht-Belved ere Sites B (few) G, N and C (poorly preserved for Sites N and C).

The study of the early Middle Palaeolithic of the Netherlands is confronted with limitations of poor quality data in terms of site integrity and chronology, except for Maastricht situated in the loess region of southern Limburg, very close to well-known Belgian sites (Fig. 3). Large numbers of lithic artefacts have been found in different localities in the Central Netherlands, here grouped under the term of Rhenen industry. They remain in secondary position in deposits which were already present when the area was covered by glaciers during MIS 6 (Table 2). “Further to the north artefacts do occur ‘geological in situ’, i.e. in the ice-pushed ridges in the Central Netherlands and on the Drenthee Frisian till plateau in the northernmost part of the country (Deeben et al., 2010), but primary archaeological in situ situations have yet to be discovered. During the Pleistocene, the northern Netherlands, as part of the Norddeutsches Tiefland, was repeatedly modified and bulldozed by glaciers. The most prominent features, the DrentheFrisian (Glacial) till plateau and the ice-pushed ridges in the central and eastern part of the country were mainly formed between c.170 and 140 ka during the Drente glaciation (MIS 6)” (Verpoorte et al., 2016).

An overview of Middle Palaeolithic research in the Netherlands is provided by Verpoorte et al. (2016), and in the two monographs dedicated to Maastricht-Belved ere (Roebroeks, 1988; De Loecker, 2006).

4.3. Belgium

Whereas early excavations at a number of Belgian sites now attributed to the early Middle Palaeolithic (i.e. Liege- Sainte-Walburge, Mesvin terrace, Saint-Symphorien-Carriere Helin) only provided a very limited chronostratigraphic control, renewed investigations at some of these sites since the 1950s in addition to excavations at newly discovered sites have improved our understanding of this particular time period. An exhaustive overview of the Belgian Palaeolithic record shows that a total of 13 sites, comprising 28 archaeological levels, can be attributed to the early Middle Palaeolithic (Fig. 3; Table 3). The bulk of data comes from open-air sites, although limited evidence suggests that humans might also have been present in some of the caves/shelters in the Meuse basin. Apart from Tooz-Grotte Walou level DI (Pirson and Di Modica, 2011), the correlation of the latter type of sites with the isotopic record remains problematic as secure absolute or relative dating evidence is lacking. For some of these contexts (Moha-Grotte de l'Hermitage, Huccorgne-Abri Sandron and Tooz-Grotte Walou level DII), an attribution to the MIS 9e6 interval can, however, not be excluded (Van Peer, 2001).

Open air-sites with good stratigraphic and reliable dating evidence are present in two geographic areas: the Haine River basin near Mons (Mesvin IV, Petit-Spiennes III, Saint-SymphorienCarriere Helin, Masnuy-Saint-Jean-Le Rissori) as well as the eastern part of the Belgian loess belt between Liege and Maastricht (Kes- selt-Op de Schans, Veldwezelt-Hezerwater, Kesselt-Nelissen, Liege- Mont Saint-Martin). There, the regional chronostratigraphic framework incorporates data from river terrace sequences, loess stratigraphy, U/Th or luminescence dating and/or heavy mineral analysis (Meijs, 2002; Pirson et al., 2009; Pirson and Di Modica, 2011; Meijs et al., 2012). While correlations with the isotopic record are overall reliable, attributions to substage levels are rarely possible (Table 3).

Although most of the archaeological remains dating to the MIS 9e6 time frame are in secondary position, a few primary contexts are available as well, for example at Kesselt-Op de Schans (level 3) and e in case a Saalian age estimate is correct e possibly also at Veldwezelt-Hezerwater (levels VLL and VLB, Meijs, 2011) and Otrange-Gisement paleolithique (level L.S.).

Unlike the late Middle Palaeolithic record in Belgium, no human remains have been found at any of these sites. Faunal remains, on the other hand, have been preserved in several alluvial (Mesvin IV, Petit-Spiennes III, Mesvin terrace) and karstic (basal levels of Walou Cave) contexts. Climatic and environmental proxies are overall rather scarce.

Regional overviews have been successively compiled by UlrixClosset (1975, 1981), Otte (1983), Cahen (1984), Van Peer (2001), Di Modica (2010), Pirson and Di Modica (2011) and Van Baelen and Ryssaert (2011).

Two sites are of particular importance in the debate concerning the onset of the Middle Palaeolithic in north-western Europe (Van Baelen, 2014). Data from Kesselt-Op de Schans (level 3) and Mesvin IV both suggest that typically Middle Palaeolithic assemblages were produced from the beginning of MIS 8 onwards. Whereas at Mesvin IV some evidence suggesting the continuing use of bifacial technology is present, such indications are absent at Kesselt-Op de Schans (level 3), where a large number of refits document the variability in lithic technology alongside artefact transport.

4.4. Germany

The German EMP record is very heterogeneous, and only a few sites (13 sites with 20 assemblages; Fig. 4; Table 4) yielded both archaeological finds (artefacts and possibly faunal remains) and an approximate chronological estimation (stratigraphic and environmental information and/or radiometric dating). Only these relatively reliable sites are listed here (Table 4), thus excluding a huge number of remaining sites (currently lacking indicative artefact assemblages or sufficiently dated stratigraphic contexts), such as Karlich Jb (€ Bosinski and Richter, 1997, 5), Hochdahl (Bosinski and Richter, 1997, 5), Mülheim (Bosinski, 1982, 25), Essen-Vogelheim (Bosinski, 1982, 24; Bosinski and Richter, 1997, 5), Essen-Werden (Bosinski, 1982, 25), Bielefeld-Lutterstrasse (Bosinski, 1967, 110), Arnum (Bosinski, 1967, 98), Alfeld (Bosinski, 1967, 98), Gronau (Bosinski, 1967, 99), Beulshausen (Bosinski, 1967, 98) for western and north-western Germany, Lüchow-Dannenberg (Steguweit, 1998) for northern Germany and Zehmen (Grahmann, 1955, 530), Leipzig-Wahren (Eissmann, 1983, 47), Leipzig-Lindenau (Eissmann, 1983, 47), Leipzig-Leutzsch (Eissmann, 1983, 47), Naumburg (Toepfer, 1981, 71), Barleben (Weber, 1995, 106), Bertingen (Weber, 1995, 106), Gerwisch (Weber, 1995, 106), Magdeburg-

Fig. 4. Distribution map of German sites from MIS 9 to 6, referenced in Table 4. Background map: image Landsat, courtesy of the U.S. Geological Survey.

Rothensee (Weber, 1995, 106), Magdeburg-Neustadt (Weber, 1995, 106), Magdeburg-Salbke (Weber, 1995, 106), Eythra for central Germany (Weber,1995,106). Additionally, a large number of surface sites have been attributed to the EMP on typological grounds (for example 12 sites in Hessen, central-western Germany; Fiedler, 1994, 37). All of these sites must be considered as EMP candidates, and many of them may deliver more information in the future.

All sites are open-air localities, except the collapsed cave of Hunas.

The chronostratigraphic framework had to be corrected:

a) The Holsteinian Interglacial has turned out to be 300,000years old and not 400,000 as previously thought. It corresponds to MIS 9 and not to MIS 11 according to the new age model for Bossel/Holstein e the key palynological eponymous Holsteinian site (Geyh and Krbetschek, 2012). As a consequence, Bilzingsleben and Schoningen (the end of the€ Lower Palaeolithic in Germany) are of MIS 9 and MIS 9/8 age respectively. They display close palynological links to the Holsteinian vegetation sequence. Unfortunately, the new evidence has since been widely ignored, and falsified age estimations for the Holsteinian have even been maintained in the INQUA chronological table of the Quaternary.
b) In Loess sequences, the one Interglacial soil ¼ one MIS Interglacial correspondence is no longer valid, and soil counts (Last Interglacial soil, second-last Interglacial soil, third-last Interglacial soil etc.) have since turned out to be unusable if they are not matched by supporting evidence from independent variables (magnetostratigraphy, chemical fingerprint comparison, radiometric dating etc.). At the important key stratigraphy of Rheindahlen, the MIS 7 Interglacial is represented by three soils instead of one: the Wickrath-soil (MIS 7.5), the Rheindahlen-soil (MIS 7.3) and the Erkelenz-soil (MIS 7.1, Schirmer, 2002, 31e47; Ikinger, 2002, 82). That means the whole sequence (including all archaeological horizons) represents MIS 7 and perhaps the onset of MIS 6, and not several climatic cycles from the Holsteinian to the Weichselian (cf. Thissen, 2006). Indeed, the latter cycle is totally absent from the Rheindahlen sequence.
c) Strata counting also caused errors to the central Germanmoraine chronology. Two major glacier advances of the Saalian (Drenthe and Warthe) have been rejected to match the MIS 8 and MIS 6 cold maxima, since both have been radiometrically dated to around 150e130,000 BP (i.e. MIS 6; Litt et al., 2007). For Markkleeberg, with its stratigraphic position under the Drenthe moraine, this makes an early MIS 6 date no less probable than the previous attribution to MIS 8 (Schafer et al.,€ 2003), which has since been correlated with the “Fuhne” glaciation (Litt et al., 2007) e a Glacial stage between the “Elster” (MIS 10) and “Saale sensu stricto” (MIS 6) glaciations.
d) New radiometric dates changed the position of some important sites: Ehringsdorf has been confirmed by recent ESR dates to belong to the MIS 7 Interglacial (Schüler, 2007). Recent research at Neumark-Nord (basin 1 and basin 2), however, lead to the correction of the former MIS 7 attribution in favour of a MIS 5e age for the locality (Serangeli et al., 2012).

The recent attribution of the Hunas sequence (Rosendahl et al., 2006) probably relied on erroneous radiometric dating of the underlying sediments as all of the other data argue for a MIS 6 age of the sequence (new dates are in preparation).

Four sites have delivered human remains attributed to Homo steinheimensis (Steinheim), early Neanderthals (Ehringsdorf, Wannen) and of controversial attribution (Hunas).

The listed sites (Table 4) show relatively good preservation, particularly Ehringsdorf (a travertine site with abundant fauna and plant remains), Schoningen and Neumark-Nord (lakeside local-€ ities), and Hunas (limestone environment with excellent bone preservation). Primary or secondary position and spatial integrity cannot always be fully evaluated due to past excavation methods, except at Schoningen, Neumark-Nord and, partially, Hunas. The€ location of archaeological finds has also been recorded for Ariendorf, Rheindahlen, Schweinskopf, Tonchesberg€ and Wannen, although their relation to the find-bearing sediments is at times debatable (e.g. Rheindahlen).

Palaeoenvironmental reconstructions from the lakeside locations of Schoningen and Neumark-Nord. Ehringsdorf and Hunas€ also yielded abundant environmental data. At other sites fauna was only partially preserved (e.g. Markkleeberg), and some assemblages totally lack any faunal or botanical remains (Rheindahlen).

Excavations are currently ongoing at Hunas, Schoningen and€ Neumark-Nord whereas research in the volcano region of the Neuwied basin (Schweinskopf, Tonchesberg, Wannen) and in the€ Rhineland (Rheindahlen) discontinued some time ago and new techniques, such as micromorphological analysis to evaluate the integrity of find-bearing sediments, have not yet been applied there.

Given all these aforementioned problems, very few EMP sites are currently well excavated, well dated and well published. Ariendorf may be the earliest EMP in Germany (Turner et al., 1997), Markkleeberg is traditionally cited as a reference site illustrating an alleged transition from the Lower to the Middle Palaeolithic although the reliability of the assemblage and its chronological position (8 or 6?) is questionable and, generally, the existence of a transition is still open to discussion (Weber, 1995). Schoningen will€ probably produce much more detailed insights into the MIS 9/8 interface and thus contribute to the question of Middle Palaeolithic origins (Serangeli et al., 2012). Ehringsdorf (Schüler, 2004) and Rheindahlen (Schirmer, 2002) are currently cited as regional MIS 7 reference sites (but see Thissen, 2006), but modern investigations are needed to firmly establish the association between the archaeological remains and the surrounding sediments. MIS 6 is probably best represented in the Middle Rhine volcanos (Bosinski and Richter, 1997), but the Hunas collapsed cave in Bavaria is the site displaying the best preservation of organic remains (Rosendahl et al., 2006).

Bearing in mind all of these restrictions, regional syntheses are available for western Germany (Bosinski and Richter, 1997) and central Germany (Weber, 1995), and include many debatable sites. The state of the chronological knowledge was summarized some years ago (Richter, 2011).

The German Middle Palaeolithic begins in MIS 8 and is well documented at the Ariendorf 1 site (age estimation c. 250 ka), based on a regional, radiometrically dated tephra chronology (Richter, 2011). Ariendorf yielded an in situ Levallois lithic assemblage along with faunal remains representative of the cold steppe. 4.5. North-eastern France

Up until now, north-eastern France has yielded 30 sites encompassing 57 archaeological layers for the 337e130 ka interval (Table 5). All these sites are open-air sites, apart from the Jurassic cave of Gigny, located in the extreme southeast of the zone (Fig. 5). However, the contexts leading to the preservation of the sedimentary deposits and archaeological layers are varied. They are made up of fluvial terraces (Abbeville, Ailly-sur-Noye, Argoeuves, Bagarre, Biache-Saint-Vaast, Cagny-l'Epinette, Drucat, Ferme de l'Epinette, Maisons-Alfort, Saint-Valery-sur-Somme, Salouel, Soucy), sinkholes (Clairy-Saulchoix, Gentelles, Gouzeaucourt, Longavesnes, Revelles), or loessic slopes. (Achenheim, Bapaume-les Osiers, Beaumetz-les-Loges, Champvoisy, Etricourt-Manancourt, Havrincourt 2, Montieres-l es-Amiens, Plachy-Buyon, Riencourt-les-Bapaume, Therdonne, Le Tillet, Vimy).

Overall, the resolution of the chronological setting in the region is satisfactory as about 60% of the occupations can confidently be correlated to an isotopic stage (Table 5). Reference sites (including the sites of Cagny, Biache-Saint-Vaast, Soucy, Therdonne and Etricourt-Manancourt) enable us to refine the chronological setting to the scale of isotopic sub-stages, mainly by using sedimentary sequences with finely recorded sedimentary litho-stratigraphic sequences that can be correlated between them, to the system of stepped alluvial terraces and to direct and indirect biochronological dates. The chronological setting is deemed to be unreliable or imprecise for 23 levels of the corpus. This can be explained by the secondary position of most of these lithic industries, which were often collected from erosion gravel, and to which we can only allocate a minimum age. At some of these sites, the presence of a Bt type luvisol attributed to the Eemian located above the levels is often the only reliable chronological marker in the sequence. The levels are then characterized by different researchers on the basis of the typological and technological criteria of the industries. These levels cannot currently be included in overall considerations if the aim, like here, is to establish a general picture based on reliable chronological data.

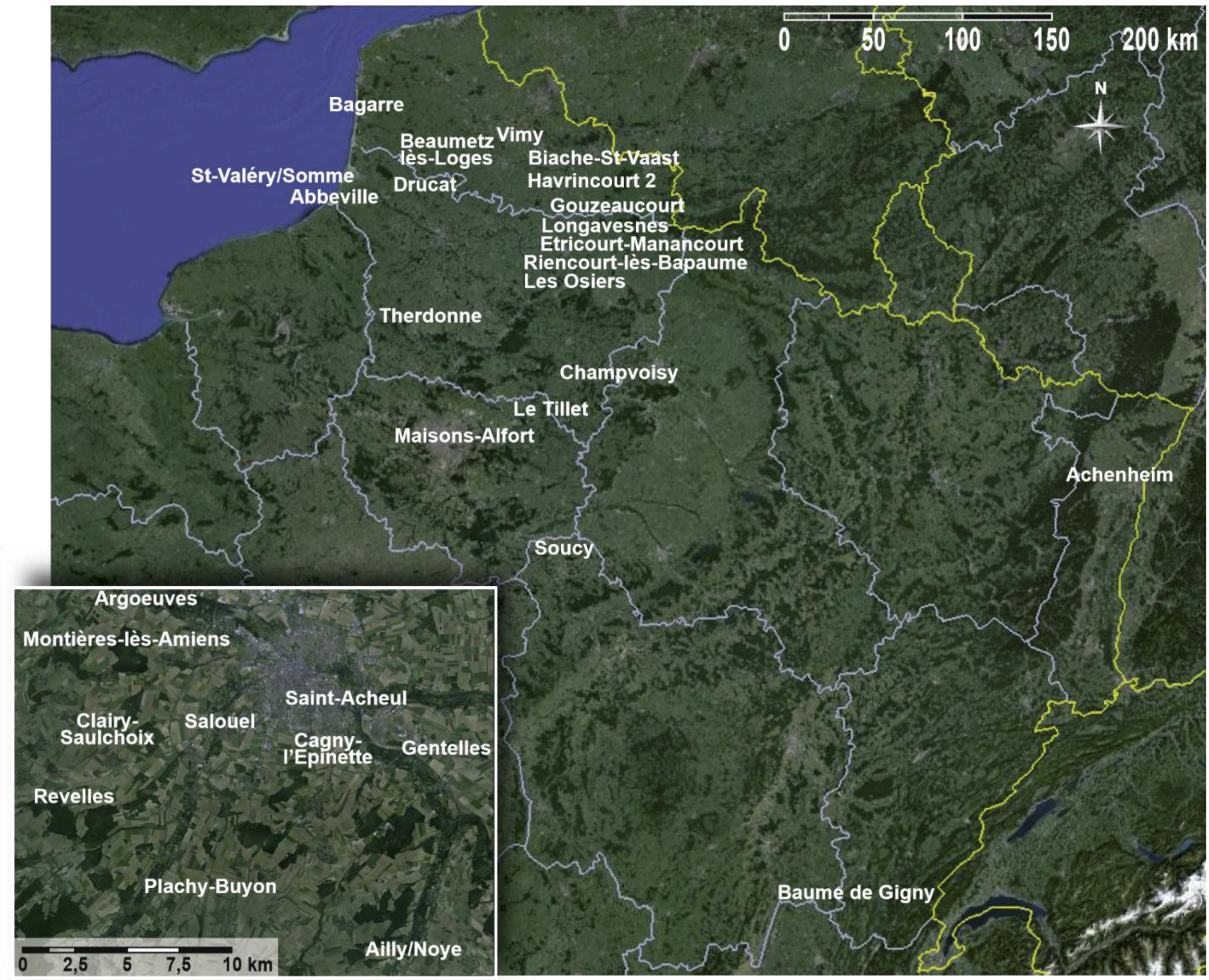

Fig. 5. Distribution map of North-east French sites from MIS 9 to 6, referenced in Table 5. Background map: image Landsat, courtesy of the U.S. Geological Survey.

The chronostratigraphic framework of the northeast of France is largely founded on lithostratigraphic observations and the study of fluvial stepped terraces. The chronological context of the sequences and occupations is reinforced by radiometric dates, namely thermoluminescence on heated flint, IRSL on loess and ESR on bones. The overall regional summary for the Saalian is rather crude in comparison to that of the Weichselian (Locht et al., 2016), but is continuously refined by new discoveries, at times with considerable headway, like for the recent discovery of Etricourt-Manancourt (Herisson et al., 2016).

Only layer IIA at Biache-Saint-Vaast has yielded human remains, including the cranial remains of two young individuals ascribed to “Early Neanderthals” (Vandermeersch, 1978; Dean et al., 1998; Hublin, 1998; Rougier, 2003; Guipert, 2005).

Over half of the recorded archaeological levels have yielded material in primary position but only several of these have been spatially preserved. Faunal remains are frequent in fluvial contexts, but are rarely accompanied by other proxies. With these elements, it is possible to partially reconstruct a regional palaeoenvironmental framework for the Saalian, but with abundant records in certain localities.

The current corpus is based on a long process of data accumulation derived from discoveries made from the 19th century until today. Two regional summaries have been established including the early phase of the Middle Palaeolithic, in 1987 by A. Tuffreau and in 2012 by D. Herisson. The region includes reference sites for the end of the Lower Palaeolithic and the beginning of the Middle Palaeolithic, such as the Cagny complex, Biache-Saint-Vaast, Soucy, Therdonne and Etricourt-Manancourt. These sites with high chronological resolution provide capital evidence of the onset of the Middle Palaeolithic and make a considerable contribution to the identification of all the facets of this key period.

4.6. North-western France

Twenty-two sites are currently referenced in the northwest of France, corresponding to at least 30 occupations (archaeological levels; Table 6; Fig. 6). Most of these are open-air sites, either in a coastal context associated with marine beaches (Barneville, Digulleville, Jobourg, Equeurdreville, Gatteville, Pleneuf-Val-Andr e, Les Gastines), or in a continental plateau context (Ranville, SaintBrice-sous-Ranes, Mauquenchy), or at times in a karst-related^ context (Ranville, Guichainville/Le Vieil-Evreux). Other occupations are in a fluvial context (Saint-Pierre-les-Elbeuf, Tancarville, Tourville-la-Riviere). Finally, several sites near the coastline were implanted at the base of granitic rock faces (Fermanville, SaintGermain-des-Vaux, Gouberville).

The degree of resolution of the chronostratigraphic context is variable, with eleven occurrences beyond the isotopic stage, fifteen in the isotopic stage frame and only one corresponding to an isotopic sub-stage. Most of the chronostratigraphic frame is constructed on lithostratigraphic observations, terrace stepping and marine beaches. However, many sites underwent radiometric dates by TL on heated flint, OSL on sediments and ESR on dental enamel in several cases (Table 6).

The site of Tourville-la-Riviere yielded three long bones from the arm of the same individual ascribed to the “Neanderthal lineage” (Faivre et al., 2014).

The preservation of the archaeological levels depends on the structuring elements of the sites. In this way, natural “traps” favoured the conservation of superficial formations near cliffs (Tancarville, Saint-Pierre-les-Elbeuf), implantations at the base of cliffs (Port- Racine, Le Rozel or Mondree), occupations in granite passages or hollows (Gel etan, Port-Pignot or Gouberville) and the conservation of archaeological levels in sinkholes (Grossoeuvre and Guichainville/Le Vieil-Evreux). Eight archaeological levels are in primary position, seventeen in secondary position (Table 6). Among those in primary position, only six levels are conducive to spatial analysis. The conservation of organic matter is very variable with faunal remains conserved at six sites and charcoal at a single site. The level of reconstruction of the palaeoenvironmental and regional palaeogeographical context is generally “partial” and “fragmentary”.

Research results for Normandy (Upper and Lower) are satisfactory on account of renewed work on sites discovered a long time ago andan activeresearchteam as partof the Collective Research Project group. This work has led to the revision of formerly excavated and studied sties and the acquisition of new data with surveys, excavations and radiometric dating. Brittany is somewhat lagging behind,

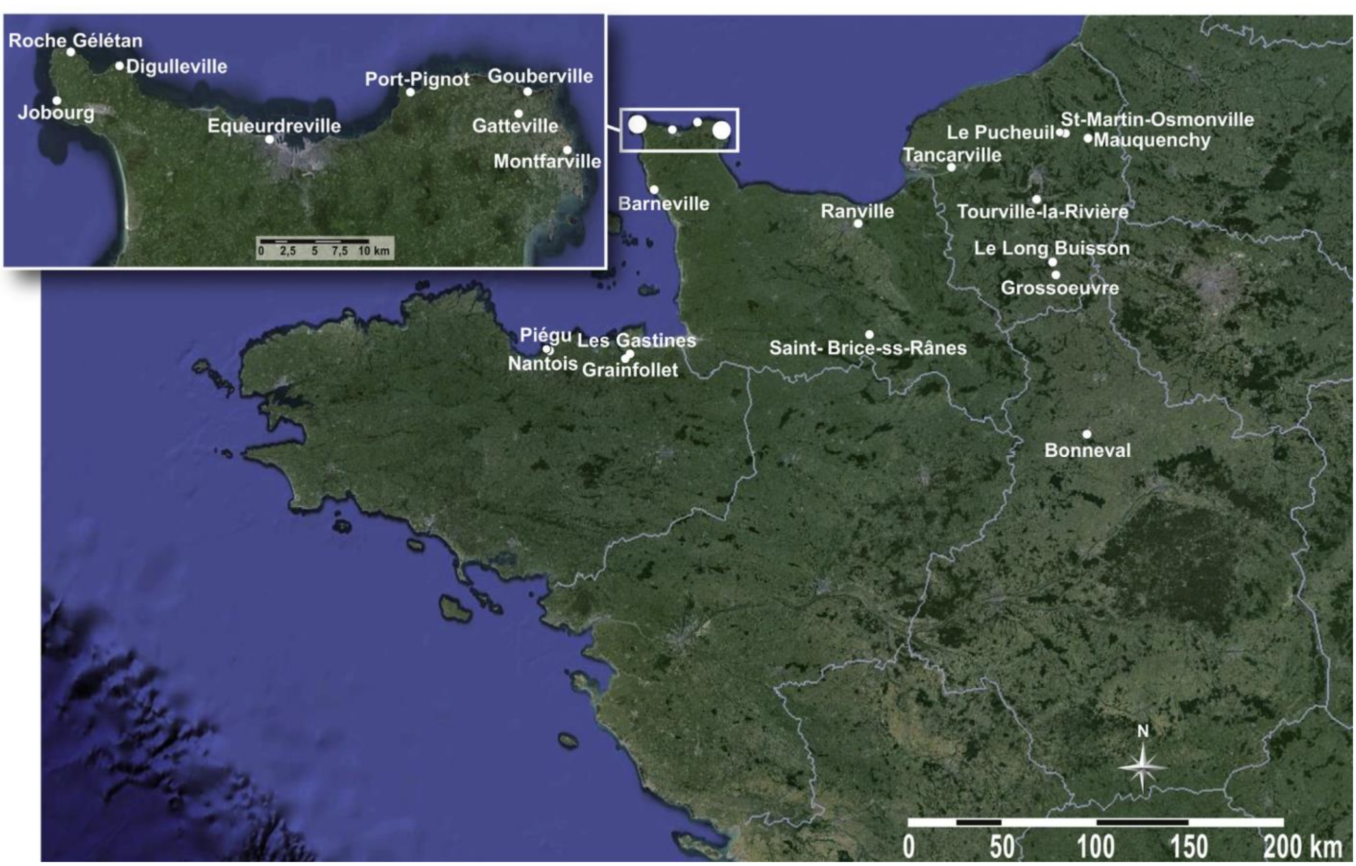

Fig. 6. Distribution map of North-west French sites from MIS 9 to 6, referenced in Table 6. Background map: image Landsat, courtesy of the U.S. Geological Survey.

but the formation of the PCR in 2015 led by M. Laforge and A.-L. Ravon should give new impetus to research at Rennes.

The reference sites for the northwest of France include the sites of Fermanville/Port-Pignot, Guichainville/Le Vieil-Evreux, Ranville, Saint-Germain-des-Vaux/Gel etan and Tourville-la-Rivi ere. Recent overviews have been published for Normandy (Cliquet and Lautridou, 2009; Cliquet, 2013a,b) and the Brittany peninsula (Monnier, 1982, 2006).

The main contribution of north-western France to the debate on the beginning of the Middle Palaeolithic concerns the conservation of habitat conservation structures at several sites. The early phase of the Middle Palaeolithic is well evidenced from 230 ka onwards at Ranville and at Tourville from 220,000 years.

4.7. South-eastern France

Six sites have yielded sequences with occupations from the beginning of the Middle Palaeolithic, with at least 17 distinct occupation levels (Table 7). They are spread out between the Massif Central, the Rhone valley, the Alpes de Haute Provence and Alpes^ Maritimes and the eastern limits of the Pyrenees. They are all relatively deep cavities or rock shelters with varied dimensions, located on plateaus or on valley edges. Some of these cavities are former collapsed sinkholes (Fig. 7).

All these sites have been dated by (single or multiple) radiometric methods on varied supports, such as bone, teeth, burnt flint, speleothems or tephras (ESR-U/Th, TL, TIMS, RPE). In some cases,

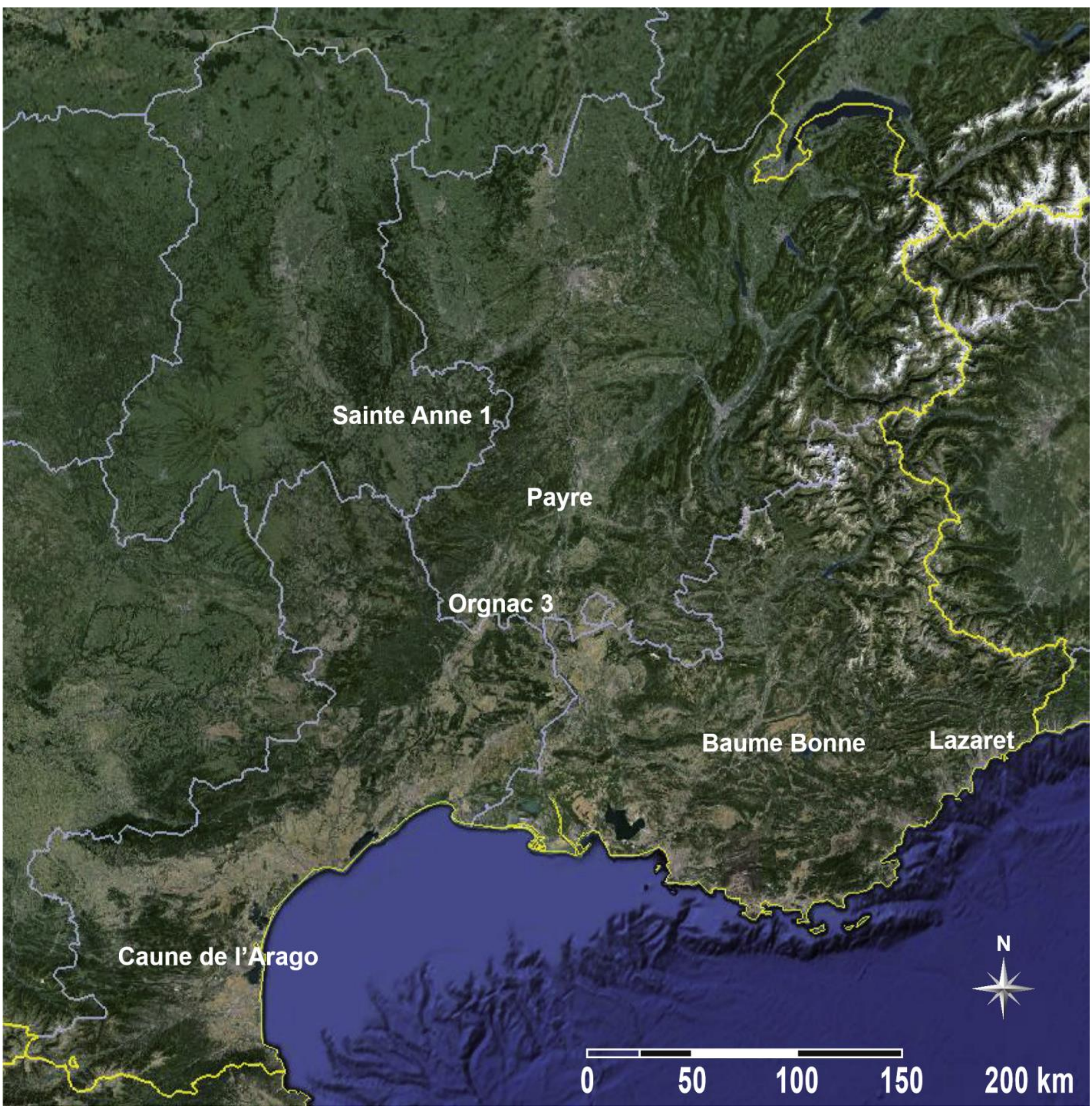

Fig. 7. Distribution map of South-east French sites from MIS 9 to 6, referenced in Table 7. Background map: image Landsat, courtesy of the U.S. Geological Survey.

the sediments were directly dated (OSL). The degree of resolution is the isotopic stage, as is generally the case in a karstic context. Only the tephra can be linked to volcanic eruptions, thereby providing a higher resolution (upper level of Orgnac 3). The chronostratigraphic framework is based on radiometric dating and biostratigraphic data (large mammals, rodents).

Three sites have yielded human remains: Lazaret (several levels), Orgnac 3 (levels 6 and 5b) and Payre (all complexes), made up of teeth, cranial and mandible fragments. They are attributed to Homo Neanderthalensis (Lazaret) or pre-Neanderthals (Payre, Orgnac 3: Moncel and Condemi, 2007; Moncel dir., 2008; Condemi et al., 2010).

The archaeological material is in primary position and the state of preservation is variable: very good at Lazaret (complex 2 with distinct AU) and at Arago, average at Saint-Anne I, Payre and Orgnac 3 (palimpsest in cavities with taphonomic processes). The fauna is systematically present but not always well-preserved. The level of palaeoenvironmental reconstruction varies from site to site; it is fragmentary at the Baume Bonne and partial for all the other sites.

The data come from early excavations (Orgnac 3, Baume Bonne), or more recent campaigns (Payre, Saint-Anne I, Arago, Lazaret). The most informative site is Orgnac 3 with levels dated from MIS 9 and the beginning of MIS 8 with the appearance of Levallois debitage. This enables us to quantify the emergence of Middle Palaeolithic type behaviour from a technical and subsistence stance.

Over the past twenty years, frequent regional overviews have been published (Moncel, 1999, 2003; Moncel et al., 2005, 2011, 2012; Moncel dir., 2008; Fontana et al., 2013). These summaries have placed the beginning of the transition between the Lower and Middle Palaeolithic at the conjunction of MIS 9 and 8, namely on account of Orgnac 3. These facts are based on technical and subsistence criteria (cf. articles): operational sequences, duration and specialization of occupations, carcass processing, disappearance of bifaces. The other sites enable us to assess the development of these parameters between MIS 8 and 6.

4.8. South-western France

For the early Middle Palaeolithic in the southwest of France, 18 sufficiently well-documented and representative sites were integrated into the database, comprising 41 archaeological levels (Table 8; Fig. 8). Among these sites, six are in karstic contexts e caves, shelters or collapsed swallow holes e and contain up to 7 successive archaeo-stratigraphic units. The twelve others are openair occupations e in plains, on alluvial ledges, or on plateaus e some over several hundred square metres, sometimes stratified in former sinkholes.

There is still some incertitude as to the chrono-stratigraphic position of the levels from Tares and Pendus, as they have not undergone direct dating (Guichard and Guichard, 1966; Delpech et al., 1995). The other 39 levels from the corpus were coherently chronologically positioned using relative chronology; such as Combe Grenal and La Borde (using biochronology), Croix de Canard, two levels from Vaufrey and one from Cantalouette 1 (using chrono-stratigraphy), or dated by different radiometric methods (ESR, U/Th, TL or OSL) (Rigaud dir., 1988; Jaubert et al., 1990; Delpech and Prat, 1995; Detrain et al., 2005; Brenet et al., 2006). Some sites were correlated to MIS 9 to 6 with a satisfactory level of reliability, such as Coudoulous, La Micoque, Les Bosses, Pech de l'Aze II, Petit Bost and others were more precisely dated, such as Suard, Barbas I, the lower levels from Vaufrey, Cantalouette 1 (level V) and Cantalouette 2, Combe Brune 2 and 3 (Schvoerer et al.,1977; Schwarcz and Debenath, 1979; Blackwell et al., 1983; Grün et al., 1991; Boeda et al., 1996; Folgado et al., 2005; Jaubert et al., 2005;€ Falgueres et al., 1997; Lahaye, 2005; Jarry et al., 2007; Brenet et al., 2008; Guibert et al., 2008; Brenet, 2011; Frouin et al., 2014; Hernandez et al., 2014).

Several sites located in the Pyrenean foothills, correlated to after isotopic stage 9, were not included in the corpus due to their strong affinities with the Acheulean Pyrenean-Garonne techno-complex. This applies to the lithic complexes from Duclos, Romenteres, Raspide 2 and Coupe Gorge (Gaillard, 1982, 1983; Colonge et al., 2012a, 2012b, 2014; Lelouvier et al., 2012; Jarry and Lelouvier, 2014).

When geo-archaeological studies have been carried out on the sites retained here, they reveal very varied degrees of disturbance, depending on the palaeo-topographic contexts and postdepositional phenomena. Consequently, few faunal assemblages are well preserved, which confines palaeo-environmental interpretations to a regional scale. The rare sites with abundant and well-preserved faunal assemblages are La Borde and the stratified sites of Coudoulous, Vaufrey, Suard, Combe Grenal, and Pech de l'Aze II. The only site of the corpus yielding Neanderthal human remains is Abri Suard with 52 cranial or mandible remains with archaic features from level 51 (Debenath, 1974a,b, Deb enath, 1989).

In addition, the technological, functional and economic studies initiated in the 1980s and 1990s on the lithic industries from Vaufrey, Combe Grenal, Coudoulous, Suard and Barbas for example, and those carried out more recently on assemblages from open-air sites, such as Cantalouette 1, Combe Brune 2 and 3, Croix de Canard and Les Bosses, have broadened our understanding of human behaviour during the early Middle Palaeolithic from the scale of a site to a wider scale of procurement, subsistence and circulation. Is it ultimately possible to position a chronological stage based on the lithic industries from the southwest, with their Middle Palaeolithic techno-complexes, varied productions methods and associated tools? It is more pertinent to assume that increasingly complex technological and social behaviours e including the anticipated management of materials and artefacts over increasingly vast territories e develops during the course of the progressive settlement of Aquitaine by the first Neanderthals from the beginning of MIS 8: such as at Les Bosses and Petit Bost with the emergence and the mastery of Levallois debitage.

Among the monographs or regional summaries focusing on the early Middle Palaeolithic in the southwest, we can (non-exhaustively) cite the work carried out in the 1980s and 1990s on the sites of Charente, Dordogne and the Lot (Jaubert, 1984; Rigaud, 1988; Delagnes, 1992a,b; Turq, 1992; Delpech et al., 1995) or more recent analyses of the northern Aquitaine and Midi-Pyrenean techno-complexes (Djema, 2008; Jarry, 2010; Brenet et al., 2014).

5. Discussions and conclusions

Working on a broad scale, in this paper we have brought together extant data to assess the state of current research on the emergence of the Middle Palaeolithic. The regional overviews show how different the record, and consequently our knowledge of human occupation, is between MIS 9 to 6 in each geographical entity. These differences largely result from broad scale difference in landscape taphonomy, and the depositional contexts from which most sites were recovered: the northern regions are dominated by open air sites, with archaeological material being recovered predominantly from fluvial or loessic deposits, whilst the southeastern French record is dominated by cave sites, and southwestern France by a combination of both. These different contexts necessarily involve different geomorphological dynamics for the landscapes that humans occupied, with a concomitant impact upon firstly, the nature of human occupation (e.g. activities) and secondly, the chances of such occupations being captured and preserved at all (and their taphonomic history over time). Moreover, context also impacts upon possibility and method of recovery (eg. historical gravel extraction versus cave prospection) and also the possibility of actually dating such occurrences, according to available proxies and relevant methods.

The Palaeolithic research history of each region also affects the structure of the record, and thus our understanding of changing human occupation patterns over time. Within some regions, there is a long history of antiquarian discoveries, but little or no investment in Palaeolithic archaeology in a preventative or development control context. The current, very variable structure of the extant record is fundamentally controlled by these two, inextricably linked factors: on one hand, context and preservation, and on the other, research history and methodologies. The contrast between regions can be illustrated by the north-eastern French and Dutch records (Fig. 9). North-east France has many excavated locales which are recorded in detail and securely attributed to a particular MIS (60% of the archaeological layers) but, 40% of the record is difficult to correlate with a particular MIS; whereas in the Netherlands, only one locality, Maastricht-Belved ere, preserves a very detailed human behavioural sketch of nine archaeological findspots, comprising the whole Saalian record for the country, except the Rhenen industry. The current Western European record of MIS 9-6 must, therefore, be considered as a partial and potentially distorted image; a modest fragment of the entire pattern of human settlement, glimpsed through

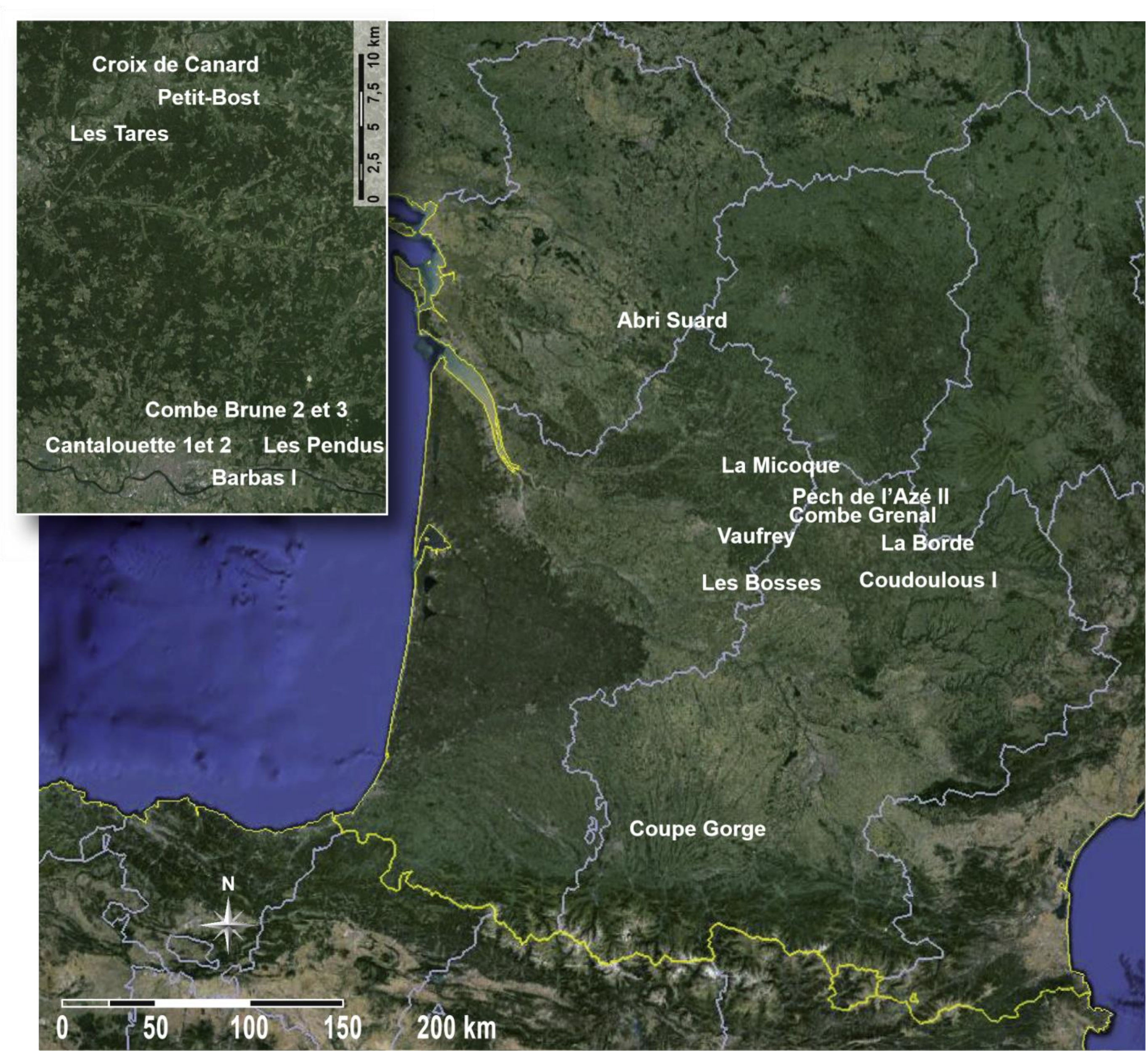

Fig. 8. Distribution map of South-west French sites from MIS 9 to 6, referenced in Table 8. Background map: image Landsat, courtesy of the U.S. Geological Survey.

multiple filters (taphonomy, research history, and fieldwork practice). It is because of these factors that the types of data, and level of detail, vary from region to region.

Taken together, all these factors contribute to why it is so difficult to bring these regional records together in order to make comparisons. As has often been pointed out, these factors have their roots in specific local research histories. Bringing this data together to address the emergence of the Middle Palaeolithic implies shifting constantly between different scales of analysis and levels of resolution. This shifting frequently masks difference between the original data, creating groups which are perhaps artificial e or drawn at such a broad level as to be largely meaningless. To work with the record as it currently stands entails that these interpretative limits be appreciated and worked with in and, it is with these caveats in mind that we address the question of what can we learn from this overview of the north-western European Palaeolithic and its southern fringes for the period MIS 9 to 6?

First, a large number of archaeological occurrences (n ¼ 236) have been attributed to this time period (MIS 9 to 6; Fig. 9). In total, 59 archaeological layers (25% of the archaeological layers; index 0e2) hold insufficient information to allow a reliable correlation with a MIS. The 177 archaeological layers considered to have a secure or relatively secure MIS correlation illustrate the richness of the current record, and the huge advances made in constructing chronological frameworks over the last forty years. Progress in radiometric dating and the construction of a unified lithostratigraphic sequence for the European loess belt are likely to drive future advances in refining these frameworks further. It should be noted that this record is not especially rich given the time span considered: 177 archaeological layers spread throughout this entire area actually equate to one human occupation per 1169 years and, in average only one occupation per 9356 years in each eight studied regions. In general, archaeological levels confidently attributed to a MIS (index 4 and 5) are carefully documented excavations which have produced abundant and varied material alongside environmental proxies.

Secondly, by concentrating only upon those occurrences which can be securely attributed to a given MIS (index 3 to 5; cf. Section 3), an overview of site distribution per MIS between regions can be proposed (Fig. 10). Here one must bear in mind the limits imposed by amalgamating all sites within a unified chronological framework at the scale of the isotopic stage (cf. Section 3). These caveats aside, most of the record (77%) can be correlated with MIS 7 and 6 (43% and 34% of all archaeological layers). There is a clear contrast between the MIS 9/8 and MIS 7/6 records which is apparent across all regions, with the exception of north-east and south-east France (Fig. 10). The apparent lack of human occupation during full Pleniglacial conditions in northern latitudes of Europe has already been noted, particularly during the Upper Pleistocene (e.g. Hublin and Roebroeks, 2009; Antoine and Locht, 2015; Herisson et al., 2015; Locht et al., 2016). Within the northern regions very few archaeological layers can be correlated to MIS 8, and there is no indication of Pleniglacial human presence. Southern France does not seem to have acted as a refuge area during MIS 8, as there is no apparent increase in occupation during this period. During MIS 7, there is a clear increase in human presence in the north which ends with the onset of the MIS 6 Pleniglacial (Fig. 10), excepting specific occurrences in Belgium and Germany. It is interesting to note there are more traces of human presence in the north during MIS 6 than MIS 8: these never reflect full Pleniglacial conditions, but could represent during short periods of more favourable conditions during MIS 6. In contrast, however, south-eastern France shows a different pattern, with the majority of archaeological layers being correlated with MIS 6: this may reflect

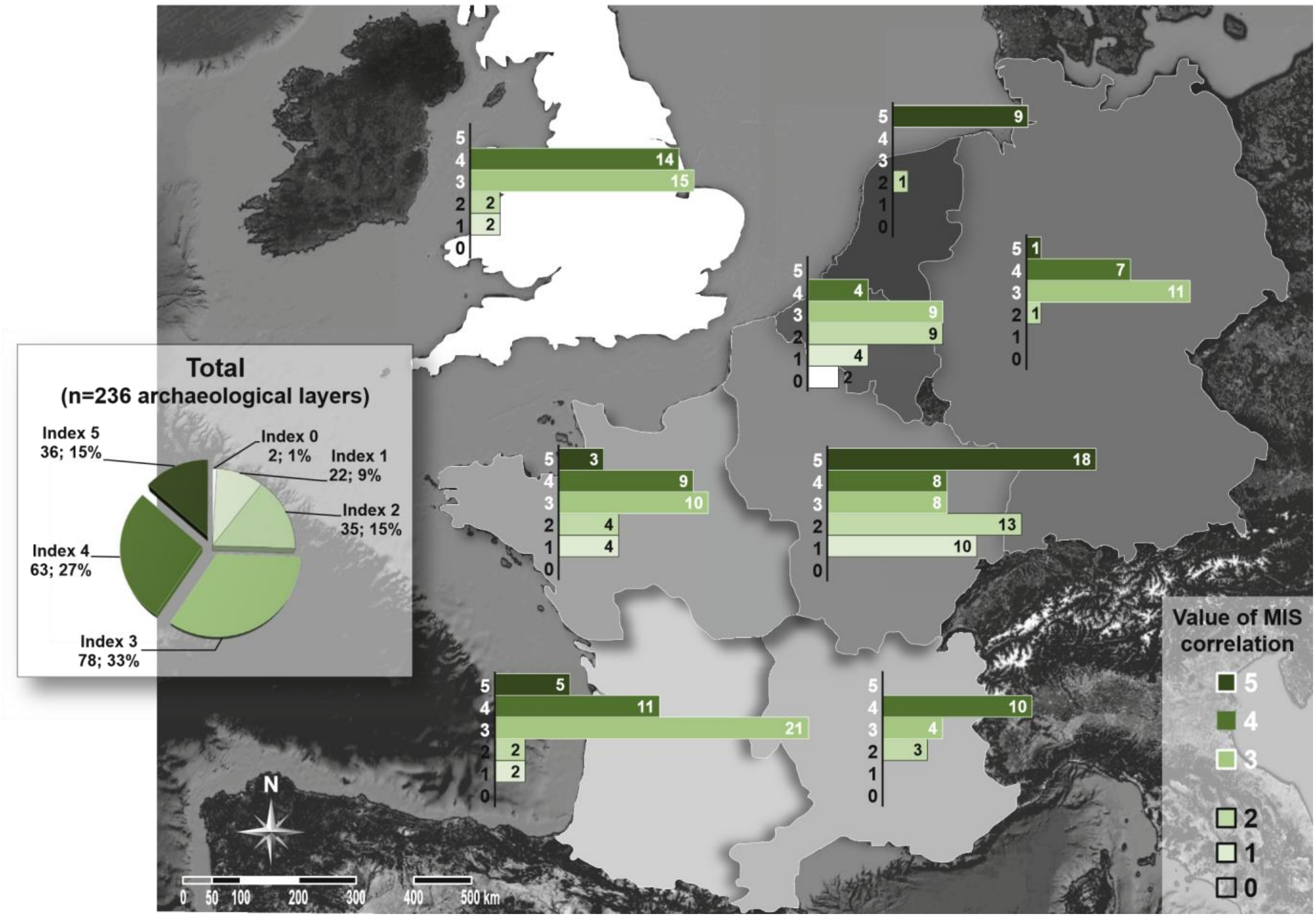

Fig. 9. MIS 9 to 6 regional overviews of the distribution of archaeological layers after the value of their MIS correlations. Background map: image Landsat, courtesy of the U.S. Geological Survey.

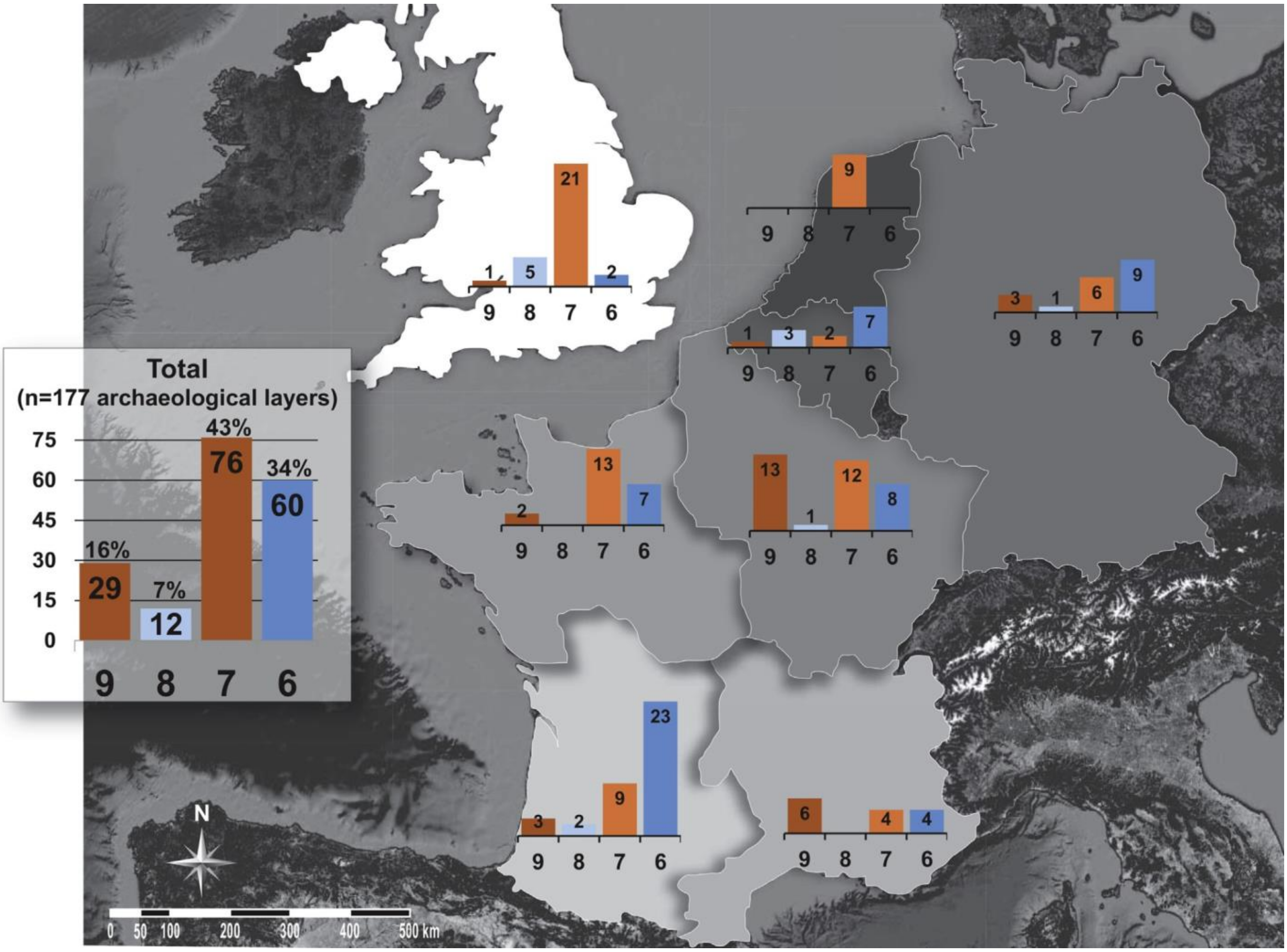

Fig. 10. MIS 9 to 6 regional overviews of the distribution of archaeological layers after their MIS correlations (only for the 172 secure correlated sites, index 3 to 5, cf. Section 3). Background map: image Landsat, courtesy of the U.S. Geological Survey.

continuous or semi-continuous settlement of the region with a concomitant increase in population size over time. Observations such as these require testing against new and increasingly detailed data, taking into account the regional taphonomic factors affecting the extant (and future) record.

Thirdly, the archaeological record of this period (MIS 9 to 6) allows us to make several observations concerning the various “chaînes operatoires ”. In compiling this dataset, we have addressed the “classical” dichotomy asserted between Acheulean bifaces production, on one hand, and Levallois methods on the other: we have taken into account the main “chaînes operatoires ” known for the end of the Lower Palaeolithic and the onset of the Middle Palaeolithic (cf. Section 3). “Acheulean” bifaces are present in MIS 9 assemblages (well represented in “Acheulean” layers in north east France; Fig. 11) but are missing from well dated, primary context sites in the Netherlands, Germany and Belgium. “Acheulean” handaxe production continues to be practiced through MIS 7 and 6, mainly in southern regions. Migrating platform core technology (“Clactonian” flaking) is strongly attested by the records of the United Kingdom, north-western France and southern France (Fig. 11). However, it does not appear to be practiced in the Netherlands, Belgium and Germany during this entire period, and is only recorded in north-eastern France during MIS 9.

“Prepared Core technology” (White and Ashton, 2003) is minimally represented in northern regions, and absent from southern regions (Fig. 11). Levallois method(s) first appear during MIS 9 (more precisely late MIS 9/early MIS 8). These initial Levallois cores and products are present within layers that are considered to be Lower Palaeolithic in character, and only ever make up a small part of these assemblages. One exception is the site of Kesselt-Op de Schans where Levallois flaking, combined with “discoidal production systems, simple prepared core technology and [...] a multiple platform core” (Van Baelen, 2014) and other technoeconomic aspects of the assemblage suggest a Middle Palaeolithic character.

After this initial appearance of Levallois flaking during late MIS 9, followed by a lack of data during MIS 8, there is a dramatic increase in both the number of sites, and the use of the Levallois method during MIS 7. During this period, at least 53 and potentially 60 archaeological layers contain Levallois artefacts, representing between 70% and 79% of the assemblages. In these series, Levallois products are usually the most important part of any toolkit, contrary to the minor role they played during MIS 9. Volumetric blade production is attested for the first time at Saint-Valery-sur-Somme (De Heinzelin and Haesaerts, 1983) during MIS 8, where an assemblage has been recovered in which a large amounts of refits could be established (Fig. 12). This method of production is rare in

"Acheulean" bifaces (shaping)					
Regions / MIS	9	8	7	6	Total

UK		4	2	1	7
Netherlands					
Belgium					
Germany				1	1
France NE	12			1	13
France NW	1		4	1	6
France SE	6		4	4	14
France SW	1		6	8	15
Total	20	4	16	16	56

Migrating Platform Core reduction / SSDA

Regions / MIS	9	8	7	6	Total
UK	1	1	12	1	15
Netherlands					
Belgium					
Germany					
France NE	8				8
France NW	1		3	1	5
France SE	6		4	1	11
France SW	1		1	5	7
Total	17	1	20	8	46

Prepared Core Technology

Regions / MIS	9	8	7	6	Total
UK	1	1	3		5
Netherlands			8		8
Belgium	1	3		3	7
Germany	2			3	5
France NE	2				2
France NW	1		5	2	8
France SE					
France SW					
Total	7	4	16	8	35

Levallois method

Regions / MIS	9	8	7	6	Total
UK	1	1	16	2	20
Netherlands			3		3
Belgium	1	3		3	7 6
Germany		1	2	3	
France NE	1		12	7	20
France NW	1		10	6	17
France SE	6		3	3	12
France SW	2		7	20	29
Total	12	5	53	44	114

Fig. 11. Number of archaeological layers with “Acheulean” bifaces (shaping), Migrating Platform Core Reduction (“Clactonian” flaking)/SSDA, Prepared Core Technology and Levallois method by regions and by MIS.

Volumetric blade method

Regions / MIS	9	8	7	6	Total
UK				1	1
Netherlands					
Belgium					
Germany			1		1
France NE		1	2		3
France NW			1		1
France SE			2	1	3
France SW			2	8	10
Total		1	8	10	19

Discoid method

Regions / MIS	9	8	7	6	Total
UK	1		8	2	11
Netherlands			5		5
Belgium	1	1		1	3
Germany					
France NE	2		2	2	6
France NW			1	1	2
France SE	6		4	4	14
France SW	2		3	8	13
Total	12	1	23	18	54

"Mousterian" bifaces (shaping)

Regions / MIS	9	8	7	6	Total
UK					
Netherlands					
Belgium		1			1
Germany			3		3
France NE				1	1
France NW			2	1	3
France SE					
France SW	1		1	2	4
Total	1	1	6	4	12

Weekly predetermined methods

Regions / MIS	9	8	7	6	Total
UK					
Netherlands			1		1
Belgium	1	1	1	6	9
Germany					
France NE	7		9	5	21
France NW			3	2	5
France SE				3	3
France SW	2		1	5	8
Total	10	1	15	21	47

Fig. 12. Number of archaeological layers with volumetric blade method, Discoid method, “Mousterian” bifaces (shaping) and weekly predeterminated methods by regions and by MIS.

MIS 7 and 6 assemblages. Discoidal flaking is almost always present, except in Germany where it is absent. “Mousterian” bifaces are mostly present in southern France, north-western France and Germany, often during MIS 7. The link between the so-called “Acheulean” and “Mousterian” bifaces is still an open question. Production methods characterised by limited predetermination are very poorly represented, if at all, and tend to be restricted to a few geographical regions (Fig. 13). The Quina method is only attested at Petit Bost (2; South-western France) during MIS 9/8 and at SainteAnne 1 and Payre (south-eastern France) and at Ebbsfleet (UK) during MIS 7. Trifacial shaping is limited to south-western France where it becomes a more important component of assemblages between MIS 9 and 6. Pebble tools are frequent in southern and north-western French assemblages throughout the period, and occur only once in Germany, at Hunas.

This brief overview of the regional distribution of the main “chaînes operatoires ” throughout this period suggests that some of the differences we see concerning technocomplexes reflect the current research agendas and research areas of schools of though rather than reflecting prehistoric behavioural patterns. The way technological strategies are defined by different researchers across the region, and the precise moment when particular analyses were undertaken, creates serious difficulties when trying to interpret the record as a whole.

To summarise, knapping methods that are viewed as Lower Palaeolithic in character, such as migrating platform core reduction (“Clactonian” flaking) and the shaping of “Acheulean” bifaces continue throughout MIS 9-6, but occur more regularly in southern regions. Towards the end of MIS 9 or at the beginning of MIS 8 (between 300 and 280 ka), Levallois flaking appears within the context of a generally “Lower Palaeolithic” technology, forming only a small part of these assemblages in the north and south: a notable exception, however, is Kesselt, where technical behaviours typical of the Middle Palaeolithic were practiced. The exceptional status of this Kesselt assemblage calls for better dating evidence for this site. There is little evidence of human presence during MIS 8

Quina method

Regions / MIS	9	8	7	6	Total
UK			1		1
Netherlands					
Belgium					
Germany					
France NE					
France NW					
France SE			3		3
France SW	1				1
Total	1		4		5

Trifacial shaping

Regions / MIS	9	8	7	6	Total
UK					
Netherlands					
Belgium					
Germany				2	2
France NE					
France NW					
France SE					
France SW	1	2	4	5	12
Total	1	2	4	7	14

Pebble tools

Regions / MIS	9	8	7	6	Total
UK					
Netherlands					
Belgium					
Germany			1		1
France NE					
France NW	1		5	1	7
France SE	6		4	4	14
France SW	1	2	5	12	20
Total	8	2	15	17	42

Fig. 13. Number of archaeological layers with Quina method, Trifacial shaping and pebble tools by regions and by MIS.

Pleniglacial. In contrast, MIS 7 was witness to an explosion in human presence, marked by a multitude of sites, the regional dominance of various Levallois methods, and the development of volumetric blade production and the Quina method. With a reversion to cold conditions during MIS 6, both southern and northern latitudes reflect an more marked human presence, in contrast to MIS 8: potentially, different cultural groups (or even, perhaps, different species?) may have co-existed in south-west France. Interestingly, this period is characterised by a series of technological innovations: the emergence of knapping methods (Levallois, discoidal, volumetric blade production) which allowed the production of controlled and predetermined endproducts (flakes, points and blades). These approaches proved both successful and long lived throughout the entire Middle Palaeolithic. Currently, our understanding of how these innovations came about and spread is considerably limited by a paucity of sites correlated to MIS 9, and particularly with the near absence of occupation during MIS 8. Taking into account data from northern and southern Europe, if one were to choose an artificial point to fix between a Lower and a Middle Palaeolithic world, it might perhaps be best placed between 300/280 and 243 ka. The extant record shows a similar scenario in northern and southern regions with the relatively rapid spread and lasting adoption of Levallois flaking after this point. As White, Scott and Ashton proposed in 2006, “the Early Middle Palaeolithic represents an intensification of Lower Palaeolithic behavioural repertoires, showing increasingly sophisticated cultural and social life underwritten by a major change in lithic technology”.

To conclude, this paper gives a critical assessment of current research on the emergence of the Middle Palaeolithic in northwestern Europe and its southern fringes. By focussing on the main “chaînes operatoires ”, rather than singling out any one for particular attention, we have been able to document one of the features of the transition between the Lower and the Middle Palaeolithic from a wider perspective than previous analyses, which mostly concentrated on the “Acheulean” biface/Levallois flaking dichotmy. A whole suite of technological approaches became widely practiced during this period (phenomenon of technical radiation), encompassing all the variety that exists throughout the entire Middle Palaeolithic. The adoption and spread of these innovations is intrinsically linked to environmental changes in a broader sense (faunal changes, landscape changes, vegetation changes, climatic condition changes and social changes). However, the fact that these varied strategies, adapted and used in different ways, emerge from this point onwards could also reflect the appearance of new cognitive abilities in western European Middle Pleistocene hominid group(s). Human remains are very few for this time period and direct links between the archaeological record (technological and behavioural changes) on one hand, and the evolution of the “Neanderthal lineage” on the other hand still have to be made and tested. However, even if “The work on understanding [the Early Middle Palaeolithic] and its significance in the evolution of archaic European hominids can begin” now (White et al., 2006), a look back through the mirror to the 1970's shows us both how far we have come, and the gap that still remains within our current knowledge of the end of the Lower Paleolithic and the onset of the Middle Palaeolithic.

Acknowledgments

We warmly thank the organisers and editors of the conference “The Middle Palaeolithic in northwest Europe: multidisciplinary approaches” at Namur where this paper was presented. We thank Louise Byrne for the translation of French contributions and an anonymous reviewer for his relevant comments.

References

Adam, K.D., 1988. Der Urmensch von Steinheim an der Murr und seine Umwelt. Ein Lebensbild aus der Zeit vor einer viertel Million Jahren. Jahrbuch des Ro€mischGermanischen Zentralmuseums Mainz 35, 3e23.

Adam, A., 1991. Le gisement paleolithique moyen du Rissori a Masnuy-Saint-Jean (Hainaut, Belgique): Premiers resultats. In: T, A. (Ed.), Paleolithique et Mesolithique Du Nord de La France: Nouvelles Recherches: II. CERP, pp. 41e52.

Adam, A., 2002. Les pointes pseudo-Levallois du gisement mousterien Le Rissori, a Masnuy-Saint-Jean (Hainaut, Belgique). L'Anthropologie 106, 695e730.

Adam, A., Tuffreau, A., 1973. Le gisement paleolithique ancien du Rissori, a MasnuySaint-Jean (Hainaut, Belgique). Bulletin de la Societe Prehistorique Française 70, 293e310.

Adler, D.S., Wilkinson, K.N., Blockley, S., Mark, D.F., Pinhasi, R., Schmidt-Magee, B.A., Nahapetyan, S., Mallol, C., Berna, F., Glauberman, P.J., Raczynski-Henk, Y., Wales, N., Frahm, E., Joris, O., MacLeod, A., Smith, V.C., Cullen, V.L., Gasparian, B.,€ 2014. Early Levallois technology and the Lower to Middle Paleolithic transition in the Southern Caucasus. Science 345, 1609e1613. http://dx.doi.org/10.1126/ science.1256484.

Agache, R., 1976. Argoeuves. In: Verron, G. (Ed.), Livret-Guide de L'excursion A10: Nord-Ouest de La France (bassin de La Seine, Bassin de La Somme et Nord). Nice, pp. 140e145.

Aldhouse-Green, S., Peterson, R., Walker, E., 2012. Neanderthals in Wales: Pontnewydd and the Elwy Valley Caves. Oxbow Books.

Ameloot-Van der Heijden, N., 1989. Les series lithiques des niveaux E et de la couche D0 du gisement paleolithique moyen de Biache-Saint-Vaast (Pas-deCalais). In: Tuffreau, A. (Ed.), Paleolithique et Mesolithique Du Nord de La France: Nouvelles Recherches. Villeneuve-d'Ascq, pp. 43e50.

Ameloot-Van der Heijden, N., 1991. Methodes d'acquisition et signification des industries lithiques au Paleolithique moyen: l'exemple des gisements de plein air du Nord de la France. Universite des Sciences et Technologies de Lille Flandres Artois, Villeneuve-d’Ascq.

Ameloot-Van der Heijden, N., 1993. L'ensemble lithique du gisement de Longavesnes (Somme): illustration d'un probleme de reconnaissance du debitage levallois dans une industrie a bifaces de la phase ancienne du Paleolithique moyen. Bulletin de la Societe prehistorique française 90, 257e264.

Ameloot-Van der Heijden, N., Dupuis, C., Munaut, A.V., Puissegur, J.J., 1996. Le gisement paleolithique moyen de Salouel (Somme, France). L'Anthropologie 100, 555e573.

Antoine, P., 1990. Chronostratigraphie et environnement du Paleolithique du Bassin de la Somme. CERP.

Antoine, P., Tuffreau, A., 1993. Contexte stratigraphique, climatique et paleotopographique des occupations acheul eennes de la moyenne terrasse de la Somme. Bulletin de la Societ e pr ehistorique française 90, 243 e250. http:// dx.doi.org/10.3406/bspf.1993.9589.

Antoine, P., Locht, J.-L., 2015. Chronostratigraphie, paleoenvironnements et peuplements au Paleolithique moyen : les donnees du Nord de la France. Memoire la Societe prehistorique française 59, 11e23.

Ashton, N.-M., Cook, J., Lewis, S.-G., Rose, J., 1992. High Lodge: Excavations by G. de G. Sieveking 1962-68 and Cook J. 1988.

Ashton, N., McNabb, J., Irving, B., Lewis, S., Parfitt, S., 1994. Contemporaneity of Clactonian and Acheulean flint industries at Barnham, Suffolk. Antiquity 68, 585e589.

Ashton, N.-M., Jacobi, R., White, M., 2003. The dating of Levallois sites in West London. Quaternary Newsletter 99, 25e32.

Ashton, N., Lewis, S.G., Hosfield, R., 2011. Mapping the human record. Population change in Britain during the Early Palaeolithic. In: Ashton, N.M., Lewis, S.G., Stringer, C.B. (Eds.), The Ancient Human Occupation of Britain. Elsevier Amsterdam, pp. 39e51.

Auguste, P., 1988. Apports paleontologiques et archeozoologiques de l'etude de la faune des grands mammiferes de Biache-Saint-Vaast (Pas-de-Calais). Revue archeologique de Picardie 63e68.

Auguste, P., 1990. Contribution a l'etude des grands Mammiferes du site peisto cen e moyen de Biache-Saint-Vaast (Pas-de-Calais, France). Etudes paleontologiques, taphonomiques et palethnologiques du niveau II base. Memoire de DEA. Museum national d'Histoire naturelle, Paris.

Auguste, P., 1994. Relations entre la taphocenose et l'evolution geologique d'un site prehistorique. L'apport du gisement Pleistocene Moyen de Biache-Saint-Vaast (Pas-de-Calais, France). Outillage peu elabore en os et bois de cervides, 6e Table Ronde Taphonomie/Bone Modification.

Auguste, P., 1995a. Chasse et charognage au Paleolithique moyen: l'apport du gisement de Biache-Saint-Vaast (Pas-de-Calais). Bulletin de la Societ e prehistorique française. http://dx.doi.org/10.3406/bspf.1995.10003.

Auguste, P., 1995b. Cadres biostratigraphiques et paleo ecologiques du peuplement humain dans la France septentrionale durant le Pleistocene. Apports de l 'etude paleontologique des grands mammi feres du gisement de Biache-Saint-Vaast (Pas-de-Calais). Museum national d'Histoire naturelle, Paris.

Auguste, P., 2003. La chasse a l'ours au Paleolithique moyen: mythes, realites e t etat de la question. Le ro^le de l'environnement dans les comportements des chasseurs-cueilleurs prehistoriques. In: Section 3, Symposium C3.1 des Actes du XIVeme Congres UISPP.

Auguste, P., 2012. L'homme et l'animal au Pleistocene en France septentrionale. Un quart de siecle de recherches paleontologiques et archeozoologiques dans le Nord de la France. Universite Lille 1, Villeneuve-d'Ascq.

Auguste, P., Patou-Mathis, M., 1994. L'Aurochs au Paleolithique. In: Patou-Mathis, M. (Ed.), Aurochs, Le Retour. Aurochs, Vaches & Autres Bovins de La Prehistoire A Nos Jours, pp. 13e26. Lons-le-Saunier.

Auguste, P., Lamotte, A., Locht, J.-L., Tuffreau, A., 2005. Le traitement de la matiere premiere lithique et osseuse au Paleolithique inferieur et moyen dans le Nord de la France: etat des recherches recentes. Les premiers peuplements en Europe.

Bahain, J.-J., 2007. La methode de datation par resonance de spin electronique (ESR) au Museum national d'histoire naturelle. Vingt ans de recherches methodologiques et d'applications geochronologiques. Memoire d'habilitation a diriger des recherches. Universite Michel de Montaigne, Bordeaux 3, Bordeaux.

Bahain, J.-J., 2009. La datation au Carbone 14. In: Depaepe, P. (Ed.), La France du Paleolithique. Editions La Decouverte, Paris, p. 104.

Bahain, J.J., Sarcia, M.N., Falgueres, C., Yokoyama, Y., 1993. Attempt at ESR dating of tooth enamel of French middle Pleistocene sites. Applied Radiation and Isotopes 44, 267e272. http://dx.doi.org/10.1016/0969-8043(93)90230-8.

Bahain, J.-J., Falguares, C., Laurent, M., 2001. Datation par resonance paramagnetique electronique (RPE) de sediments et par combinaison des methodes RPE/U-Th de restes paleontologiques (provenant des sites paleolithiques de Cagny). Publications du CERP, pp. 37e40.

Bahain, J.-J., Falgueres, C., Laurent, M., Voinchet, P., Dolo, J.-M., Antoine, P., Tuffreau, A., 2007. ESR chronology of the Somme River Terrace system and first human settlements in Northern France. Quaternary Geochronology 2, 356e362. http://dx.doi.org/10.1016/j.quageo.2006.04.012.

Bahain, J.J., Falgueres, C., Laurent, M., Shao, Q., Dolo, J.M., Garcia, T., Douville, E., Frank, N., Monnier, J.L., Hallegou et, B., Laforge, M., Huet, B., Auguste, P.,€ Liouville, M., Serre, F., Gagnepain, J., 2012. ESR and ESR/U-series dating study of several middle Palaeolithic sites of Pleneuf-Val-Andr e (Brittany, France): Pi egu, Les Vallees and Nantois. Quaternary Geochronology 10, 424 e429. http:// dx.doi.org/10.1016/j.quageo.2012.02.013.

Bahain, J.-J., Falgueres, C., Laurent, M., Dolo, J.-M., Shao, Q., Auguste, P., Tuffreau, A., 2015. ESR/U-series dating of faunal remains from the paleoanthropological site of Biache-Saint-Vaast (Pas-de-Calais, France). Quaternary Geochronology. http://dx.doi.org/10.1016/j.quageo.2015.02.020.

Balescu, S., 1988. Apports de la thermoluminescence a la stratigraphie et a la sedimentologie des loess saaliens du Nord-ouest de l'Europe. Universite libre de Bruxelles, Bruxelles.

Balescu, S., Tuffreau, A., 2004. La phase ancienne du Paleolithique moyen dans la France septentrionale (stades 8 a 6): apports de la datation par luminescence des sequences loessiques. Archaeological almanac 16, 5e22.

Balescu, S., Lamothe, M., Lautridou, J.-P., 1997. Luminescence evidence for two Middle Pleistocene interglacial events at Tourville, northwestern France. Boreas 26, 61e72. http://dx.doi.org/10.1111/j.1502-3885.1997.tb00651.x.

Barsky, D., 2013. The Caune de l'Arago stone industries in their stratigraphical context. Comptes Rendus Palevol 12, 305e325. http://dx.doi.org/10.1016/ j.crpv.2013.05.007.

Bates, M.R., Wenban-Smith, F.F., Bello, S.M., Bridgland, D.R., Buck, L.T., Collins, M.J., Keen, D.H., Leary, J., Parfitt, S.A., Penkman, K., Rhodes, E., Ryssaert, C., Whittaker, J.E., 2014. Late persistence of the Acheulian in southern Britain in an MIS 8 interstadial: evidence from Harnham, Wiltshire. Quaternary Science Reviews 101, 159e176. http://dx.doi.org/10.1016/j.quascirev.2014.07.002.

Baumann, W., Mania, D., 1983. Die pala€olithischen Neufunde von Markkleeberg bei Leipzig. VEB Deutscher Verlag der Wissenschaften.

Behm-Blancke, G., 1960. Altsteinzeitliche Rastpla€tze im Travertingebiet von Taubach, Weimar, Ehringsdorf. Alt-Thüringen 4, 1e246.

Bertran, P., Texier, J.-P., 1990. L'enregistrement des phenomenes pedo-sedimentaires et climatiques. L'exemple de la coupe des Tares (Dordogne). Quaternaire 1, 77e90.

Beyries, S., 1988. Etude traceologique des racloirs du niveau IIA. In: Le Gisement Paleolithique Moyen de Biache-Saint-Vaast (Pas-de-Calais). Stratigraphie Environnement Etudes Archeologiques, vol. I, pp. 215e230.

Blackwell, B., Schwarcz, H.P., Debenath, A., 1983. Absolute dating of hominids and palaeolithic artifacts of the cave of La Chaise-de-Vouthon (Charente), France. Journal of Archaeological Science. http://dx.doi.org/10.1016/0305-4403(83) 90033-X.

Blondiau, L. dir., Coutard, S., Ducrocq, T., Locht, J.-L., Sellier-Segard, N., 2009. Aillysur-Noye (Somme). “La Voirie de Guyencourt,” Rapport de diagnostic. INRAP, SRA Picardie.

Boe€da, E., 1986. Le debitage Levallois de Biache-Saint-Vaast (Pas-de-Calais): premiere etude technologique. In: Chronostratigraphie et facies culturels du Paleolithique inferieur et moyen dans l'Europe du Nord-Ouest, Actes du 22 Congres Prehistorique de France.

Boe€da, E., 1988a. Analyse technologique du debitage du niveau IIA. In: Tuffreau, A., Somme, J. (Eds.), Le Gisement Paleolithique Moyen de Biache-Saint-Vaast (Pasde-Calais). Stratigraphie, Environnement, Etudes Archeologiques (1ere Partie). Societ e Prehistorique Française, pp. 185e214.

Boe€da, E., 1988b. Le concept laminaire: rupture et filiation avec le concept Levallois. L'Homme de Neandertal, Actes du colloque international de Liege (4-7 decembre 1986), vol. 4: (La mutation, J.K.Kozlowski coord).

Boe€da, E., 1990. De la surface au volume: analyse des conceptions des debitages Levallois et laminaire. Paleolithique moyen recent et Paleolithique superieur ancien en Europe 3, 63e68.

Boe€da, E., 1991. La conception trifaciale d'un nouveau mode de taille paleolithique. Les premiers Europeens. In: Actes du 114e Congres national des Societes savantes (Paris, 3e9 avril 1989).

Boe€da, E., 1993. Le debitage discoïde et le debitage Levallois recurrent centripete. Bulletin de la Societ e prehistorique française 90, 392e404.

Boe€da, E., 1994. Le concept Levallois: variabilite des methodes. In: Monographie du CRA, 9. CNRS Editions, Paris.

Boe€da, E., 1997. Technogenese de systemes de production lithique au Pa leolithique inferieur et moyen en Europe Occidentale et au Proche-Orient. Universite de Paris X-Nanterre, Nanterre.

Boe€da, E., 2001. Determination des unites techno-fonctionnelles de pieces bifaciales provenant de la couche acheuleenne C'3 base du site de Barbas I. In: Cliquet, D . (Ed.), Les Industries A Outils Bifaciaux Du Paleolithique Moyen d'Europe Occidentale. Actes de La Table Ronde Internationale Organisee A Caen (Basse Nor mandie e France) 14 et 15 Octobre 1999. Universite-Service de Prehistoire, Liege, pp. 51e75.

Boe€da, E., Pelegrin, J., 1983. Approche technologique du nucleus Levalloi s a eclat. Etudes prehistoriques 1979e1980, 41e48.

Boe€da, E., Kerzavo, B., Mercier, N., Valladas, H., 1996. Barbas C'3 base (Dordogne). Une industrie bifaciale contemporaine des industries du Mousterien ancien: une variabilite attendue. In: Bietti, A., Grimaldi, S. (Eds.), Reduction Processes (“chaînes Operatoires”) for the European Mousterian, Actes Du Colloque International de Rome. Quaternaria nova, VI, Rome, may 26-28 1995, pp. 465e504.

Boe€da, E., Soriano, S., Noe€l-Soriano, S., 2004. Fonction et fonctionnement d'un site a la fin du Pleistocene moyen. Le niveau acheuleen C 3, 293e305.

Bordes, F., 1950. L'evolution buissonnante des industries en Europe occidentale: considerations theoriques sur le Paleolithique ancien et moyen.

Bordes, F., 1954. Les limons quaternaires du bassin de la Seine. Stratigraphie et Archeologie paleolithique. In: Archives de l'Institut de Paleontologie humaine, Memoire 26. Masson et. ed, Paris, p. 472.

Bordes, F., 1955. La stratigraphie de la Grotte de Combe-Grenal, commune de Domme (Dordogne). Note preliminaire. Bulletin de la Societe prehistorique de France 52, 426e429.

Bordes, F., 1971. Observations sur l'Acheuleen des grottes de Dordogne. Munibe 23, 5e23.

Bordes, F., 1972. A Tale of Two Caves. HarperCollins Publishers, New York.

Bordes, F., 1984. Leçons sur le Paleolithique. In: le Paleolithique en Europe, tome II. CNRS Editi. ed. Cahiers du Quaternaire, 7, Paris.

Bordes, F., Fitte, P., 1953. L'Atelier Commont. L'Anthropologie 57, 1e45.

Bordes, F., Prat, F., 1965. Observations sur les faunes du Riss et du Würm I en Dordogne. L'Anthropologie 69, 31e46.

Bordes, F., Laville, H., Paquereau, M.M., 1966. Observations sur le Pleistocene superieur du gisement de Combe-Grenal (Dordogne). Actes de la Societe Linneenne de Bordeaux 103, 3e19.

Bosinski, G., 1967. Die mittelpal€aolithischen Funde im westlichen Mitteleuropa. Bo€hlau.

Bosinski, G., 1976. L'Acheuleen en Europe centrale du Nord. In: Colloque X: L'evolution de l'Acheuleen en Europe, IXe Congres UISPP.

Bosinski, G., 1982. Das Eiszeitalter im Ruhrland. Rheinland-Verlag.

Bosinski, G., Richter, J., 1997. Pala€olithikum und Mesolithikum. Rheinland-Verlag.

Bosinski, G., Brunnacker, K., Turner, E., 1983. Ein Siedlungsbefund des frühen Mittelpala€olithikums von Ariendorf, Kr. Neuwied. Arch€aologisches Korrespondenzblatt 13, 157e169.

Bouchet, J.-P., 1986. Les gisements du Paleolithique moyen de Biache-Saint-Vaast et Seclin (Nord de la France). Organisation spatiale des vestiges archeologiques. Ecole Pratique des Hautes Etudes, Paris.

Bourdier, F., 1969. Excursion dans le bassin de Paris de l'Association Internationale pour l'Etude du Quaternaire du 18 au 28 août 1969: etude comparee des depo^ts quaternaires des bassins de la Seine et de la Somme. Bulletin d'Information des Geologues du Bassin de Paris 21, 169e220.

Bourdier, F., Munaut, A.V., Prat, F., Puissegur, J.-J., 1974. Les depo^ts du complexe rissien de la Somme. Bulletin de l'Association française pour l'etude du quaternaire 11, 219e227.

Bourguignon, L., 1997. Le Mousterien de type Quina: nouvelle definition d'une technique. These de doctorat. Universite de Paris X-Nanterre, Nanterre.

Bourguignon, L., Djema, H., Bertran, P., Lahaye, C., Guibert, P., 2008. Le gisement Saalien de Petit-Bost (Neuvic, Dordogne) a l'origine du Mousterien d'Aquitaine? Les societes du Paleolithique dans un grand sud-ouest de la France: nouveaux gisements, nouveaux resultats, nouvelles methodes. In: Actes de la seance SP F. Bradley, B.A., Sampson, C.G., 1978. Artifacts from the cottages site. In: Sampson, C.G. (Ed.), Palaeoecology and Archaeology of an Acheulian Site at Caddington, England. Department of Anthropology, Institute for the Study of Earth and Man, Southern Methodist University, pp. 83e138.

Brenet, M., 2011. Variabilite et signification des productions lithiques au Paleolithique moyen ancien. L'exemple de trois gisements de plein-air du Bergeracois (Dordogne, France). Universite de Bordeaux I, Bordeaux.

Brenet, M., 2013. et signification des productions au Paleolithique moyen ancien. l'exemple de trois gisements de plein-air du Bergeracois (Dordogne, France). BAR International Series, n 2548.

Brenet, M., Folgado, M., Guibert, P., Lenoble, A., Farid, S., Joseba, R.G., Vieillevigne, E., 2006. Cantalouette 1 (Creysse, Dordogne), Etude inter-disciplinaire de trois niveaux du Paleolithique ancien. Bergerac, R.N. 21 section nord. INRAP.

Brenet, M., Folgado, M., Bertran, P., Lenoble, A., Guibert, P., Vieillevigne, E.E., 2008. Interpretation de la variabilite technologique de deux industries du Paleolithique moyen ancien du Bergeracois: Cantalouette 1 et Combe Brune 3 (Creysse, Dordogne). Contexte geoarcheologique et chronologique, analyse techno-economique. In: Jaubert, J., Bordes, J.-G., Ortega, I. (Eds.), Les Societes Paleolithiques D'un Grand Sud-Ouest: Nouveaux Gisements, Nouvelles Methodes, Nouveaux Resultats. Memoires de La Societe Prehistorique Française, XLVII. Societe Prehistorique Française, pp. 57e81.

Brenet, M., Bourguignon, L., Colonge, D., Folgado, M., Jarry, M., Lelouvier, L.A., Mourre, V., Turq, A., 2014. Les technocomplexes au debut du Paleolithique moyen en Aquitaine septentrionale : complexite, complementarite des productions de debitage et de façonnage et implications comportementales. In: Brenet, M., Bourguignon, L., Jarry, M. (Eds.), Emergence et Diversite Des TechnoComplexes Du Paleolithique Moyen Ancien. Relations Entre Productions de Debitage et de Façonnage., Session C Du XXVIIe Congres Prehistorique de France, 31 Mai e 5 Juin 2010. Societe Prehistorique Française, Bordeaux e Les Eyzies, pp. 81e102.

Breuil, H., 1913. Les subdivisions du paleolithique superieur et leur signification. In: Congres international d'anthropologie et d'archeologie prehistoriques-compterendu de la XIVeme session, Geneve, 1912, tome 1, pp. 165e238.

Briart, A., Cornet, F., Houzeau de Lehaie, A., 1872. Rapport sur les decouvertes geologiques et archeologiques faites a Spiennes en 1867, pp. 354e398. Memoires et publications de la Societ e des Sciences, des Arts et des Lettres du Hainaut 2.

Bridgland, D.R., 1994. The Lower Paleolithic Site at Hoxne, England. In: Proceedings of the Geologists' Association. The University of Chicago Press, Chicago, pp. 236e238. http://dx.doi.org/10.1016/S0016-7878(08)80124-1.

Bridgland, D.R., 2001. The Pleistocene evolution and palaeolithic occupation of the Solent River. In: Wenban-Smith, F.F., Hosfield, R.T. (Eds.), Palaeolithic Archaeology of the Solent River, pp. 15e25.

Bridgland, D.R., 2006. The Middle and Upper Pleistocene sequence in the Lower Thames: a record of Milankovitch climatic fluctuation and early human occupation of southern Britain. Proceedings of the Geologists' Association 117, 281e305. http://dx.doi.org/10.1016/S0016-7878(06)80036-2.

Bridgland, D.R., Harding, P., Allen, P., Candy, I., Cherry, C., George, W., Horne, D.J., Keen, D.H., Penkman, K.E.H., Preece, R.C., Rhodes, E.J., Scaife, R., Schreve, D.C., Schwenninger, J.-L., Slipper, I., Ward, G.R., White, M.J., White, T.S., Whittaker, J.E., 2013. An enhanced record of MIS 9 environments, geochronology and geoarchaeology: data from construction of the High Speed 1 (LondoneChannel Tunnel) rail-link and other recent investigations at Purfleet, Essex, UK. Proceedings of the Geologists' Association 124, 417e476. http://dx.doi.org/10.1016/j.pgeola.2012.03.006.

Bringmans, P.M.M.A., 2006a. Multiple Middle Palaeolithic occupations in a Loesssoil sequence at Veldwezelt-Hezerwater. Limburg, Belgie€. Katholieke Universiteit Leuven, Leuven.

Bringmans, P.M.M.A., 2006b. Seven well-preserved in-situ Middle Palaeolithic open-air sites in a loess-soil “climate-calender” sequence at VeldwezeltHezerwater, Belgium. Notae Praehistoricae 26, 9e18.

Bringmans, P.M.M.A., 2007. First evidence of Neanderthal presence in Northwest Europe during the Late Saalian “Zeifen Interstadial” (MIS 6.01) found at the VLL and VLB sites at Veldwezelt-Hezerwater, Belgium. PalArch's Journal of Archaeology of Northwestern Europe 1, 1e15.

Bringmans, P.M.M.A., Vermeersch, P.M., Gullentops, F., Groenendijk, A.J., Meijs, E.P.M., de Warrimont, J.-P., Cordy, J.-M., 2003. Preliminary excavation report on the Middle Palaeolithic Valley Settlements at Veldwezelt-Hezerwater (Prov. Of Limburg). Archeologie in Vlaanderen e Archaeology in Flanders 1999/ 2000 VII, 9e30.

Brown, J.A., 1889. Working Sites and Inhabited Land Surfaces of the Palaeolithic Period. In the Thames Valley, Etc. publisher not identified.

Bringmans, P.M.M.A., Vermeersch, P.M., Groenendijk, A.J., Meijs, E.P.M., De Warrimont, J.P., Gullentops, F., 2001a. The Middle Palaeolithic Valley settlements at Veldwezelt-Hezerwater (Belgian-Limburg): excavation campaign 2001. Notae Praehistoricae 21, 7e17.

Bringmans, P., Vermeersch, P.M., Groenendijk, A.J., Meijs, E.P.M., de Warrimont, J.P., Gullentops, F., 2001b. The Saalian Middle Palaeolithic “Lower Site” at Veldwezelt-Hezerwater. In: XIVe Congres de l'Union Internationale des Sciences Prehistoriques et Protohistoriques. Liege, 2e8 septembre 2001. Pre-Actes-PrePrints.

Brown, J.A., 1886. The Thames-valley Surface-deposits of the Ealing District and their associated Palæolithic Floors. Quarterly Journal of the Geological Society 42, 192e200. http://dx.doi.org/10.1144/GSL.JGS.1886.042.01-04.22.

Brown, J.A., 1887. Palæolithic Man in NW Middlesex. Macmillan & Company.

Buckingham, C.M., 2007. The context of mammoth bones from the middle Pleistocene site of Stanton Harcourt, Oxfordshire, England. Quaternary International 169e170, 137e148. http://dx.doi.org/10.1016/j.quaint.2006.05.036.

Buckingham, C.M., Roe, D.A., Scott, K., 1996. A preliminary report on the Stanton Harcourt Channel Deposits (Oxfordshire, England): geological context, vertebrate remains and palaeolithic stone artefacts. Journal of Quaternary Science 11, 397e415. http://dx.doi.org/10.1002/(SICI)1099-1417(199609/10)11:5<397::AIDJQS261>3.0.CO;2-M.

Burchell, J.P.T., 1933. IV.dThe Northfleet 50-foot Submergence later than the Coombe Rock of post-Early Mousterian times. Archaeologia (Second Series) 83, 67e92.

Burchell, J.P.T., 1935. Some Pleistocene deposits at Kirmington and Crayford. Geological Magazine 72, 327e331.

Burchell, J.P.T., 1936. A final note on the Ebbsfleet Channel Series. Geological Magazine 73, 550e554.

Burie, H., 1992. Etude de l'industrie lithique du niveau II alpha du gisement paleolithique moyen de Biache-Saint-Vaast (Pas-de-Calais). Universite des Sciences et Technologies de Lille, Villeneuve-d'Ascq.

Burie, H., 1996. Etude de la repartition spatiale des vestiges du Paleolithique inferieur et moyen intrasite et inter-sites. Memoire de l'Universite des Sciences et Technologies de Lille, Villeneuve-d'Ascq.

Busschers, F.S., Kasse, C., van Balen, R.T., Vandenberghe, J., Cohen, K.M., Weerts, H.J.T., Wallinga, J., Johns, C., Cleveringa, P., Bunnik, F.P.M., 2007. Late Pleistocene evolution of the Rhine-Meuse system in the southern North Sea basin: imprints of climate change, sea-level oscillation and glacio-isostacy. Quaternary Science Reviews 26, 3216e3248. http://dx.doi.org/10.1016/j.quascirev.2007.07.013.

Busschers, F.S., Van Balen, R.T., Cohen, K.I.M.M., Kasse, C., Weerts, H.J.T., Wallinga, J., Bunnik, F.P.M., 2008. Response of the RhineeMeuse fluvial system to Saalian ice-sheet dynamics. Boreas 37, 377e398. http://dx.doi.org/10.1111/j.15023885.2008.00025.x.

Cahen, D., 1984. Paleolithique inferieur et moyen en Belgique. In: Cahen, D., Haesaerts, P., Watteyne, D. (Eds.), Peuples Chasseurs de La Belgique Prehistorique Dans Leur Cadre Naturel. Institut Royal des Sciences naturelles de Belgique, Bruxelles, pp. 133e155.

Cahen, D., Haesaerts, P., 1981. Le site paleolithique moyen de Mesvin. Archaeologia Belgica 253, 10e13.

Cahen, D., Haesaerts, P., 1982. Le site Paleolithique moyen de Petit-Spiennes III. Archaeologica Belgica 247, 5e9.

Cahen, D., Haesaerts, P., 1983. Paleolithique inferieur et moyen dans la region de Mons. Archaeologia Belgica 253, 10e13.

Cahen, D., Michel, J., 1986. Le site paleolithique moyen ancien de Mesvin IV (Hainaut, Belgique). In: Tuffreau, A., Somme, J. (Eds.), Chronostratigraphie et Facies Culturels Du Paleolithicque Inferieur et Moyen Dans l'Europe Du Nord-Ouest. Actes Du Colloque International Organise A l'Universite Des Sciences et Techniques de Lille Dans Le Cadre Du 22eme Congres Prehistorique de France, L. Societe Prehistorique Française e Association Française pour l'Etude du Quaternaire, Paris, pp. 89e102.

Cahen, D., Haesaerts, P., Michel, J., 1979. L'industrie Acheuleene de la nappe alluviale de Mesvin. Archaeologica Belgica 213, 5e9.

Cahen, D., Haesaerts, P., Szabo, B.J., Van Neer, W., Wanet, P., 1984. An early Middle Palaeolithic site at Mesvin IV (Mons, Belgium). Its significance for stratigraphy and palaeontology. Bulletin de l'Institut Royal de Sciences naturelles de Belgique 31, 1e20.

Cahen, D., Haesaerts, P., Watteyne, D., 1985. La nappe alluviale de Petit-Spiennes et le debut du debitage levallois dans la vallee de la Haine. Archaeologia Belgica Bruxelles 1, 7e16.

Callow, P., Cornford, J.-M., 1986. La Cotte de Sainte Brelade (Jersey) 1961-1978. Excavations by C.B.M. Mc Burney. Geobooks.

Campy, M., Vuillemey, M., 1989. La stratigraphie des depo^ts. In: La Baume de Gigny (Jura), pp. 17e25.

Chandler, R.H., 1916. The implements and cores of Crayford. Proceedings of the Prehistoric Society of East Anglia 2, 240e248.

Chausse, C., 2003. Les nappes alluviales de la basse vallee de l'Yonne, approches geometrique et chronostratigraphique e L'apport de l'etude de la Nappe de Soucy a la comprehension des occupations du Paleolithique inferieur de Soucy, vol. 2, p. 247 (U.F.R. de Geographie These de D).

Chertier, B., Hinout, J., 1988. Le gisement mousterien de Champvoisy (Marne), lieudit Les Petits Ba^tis. Etude du mobilier lithique. Prehistoire et Protohistoire en Champagne-Ardenne 12, 9e30.

Chevrier, B., 2006. De l'Acheuleen m eridional au technocomplexe trifacial: la face cachee des industries du Bergeracois. Apport de l'analyse technologique de l’industrie lithique de Barbas I C'4 sup (Creysse, Dordogne). Gallia prehistoire. http://dx.doi.org/10.3406/galip.2006.2451.

Cliquet, D. dir., 2008. Le site pleistocene moyen recent de Ranville (Calvados e France) dans son contexte environnemental. Analyse du fonctionnement d'une aire de boucherie soutiree par un reseau karstique. ERAUL, p. 11 9.

Cliquet, D. dir., 2010. Tourville-la-Riviere, Seine-Maritime. Carrieres et ballastieres de Normandie: La Fosse-Marmitaine. Rapport final d'operation.

Cliquet, D., 2013. Les occupations paleolithiques en Normandie dans leur contexte chronostratigraphique: «bribes archeologique s». Quaternaire 24, 315e358.

Cliquet, D. dir., 2013. Les Occupations paleolithiques du gisement de Long-Buisson a Guichainville/Le Vieil-Evreux (Eure e France) dans leur contexte chronostratigraphique. Eraul 137. Universite de Liege.

Cliquet, D., Lautridou, J.P., 2009. Les occupations humaines du Pleistocene moyen de Normandie dans leur cadre environnemental. Quaternaire 20, 303e320.

Cliquet, D., Mercier, N., Valladas, H., Froget, L., Michel, D., Van Vliet-Lanoe€, B., Vilgrain, G., 2003. Apport de la thermoluminescence sur silex chauffes a la chronologie de site paleolithiques de Normandie: nouvelles donnees et interpretations ([Thermoluminescence anting of burnt flints from Palaeolithic sites of Normandy recent advances]). Quaternaire 14, 51e64.

Cliquet, D., Lautridou, J.-P., Lamothe, M., Mercier, N., Schwenninger, J.-L., Alix, P., Vilgrain, G., 2009a. Plages perchees, heads et occupations humaines de la Pointe de la Hague (Cotentin e Normandie). Le site de la Baie d'Ecalgrain. Quaternaire 20, 345e359.

Cliquet, D., Mercier, N., Lautridou, J.-P., Alix, P., Beugnier, V., Bianchini, R., Caspar, J.P., Coutard, S., Lasseur, E., Lorren, P., Gosselin, R., Rivard, J.-J., Valladas, H., 2009b. Un atelier de production et de consommation d'outils bifaciaux de la fin du Paleolithique moyen a Saint-Brice-sous-R^anes (Orne, France) dans son contexte environnemental. Quaternaire 20, 361e379.

Collins, D., Allen, T.J., Hubbard, R.N.L.B., 1978. Early Man in West Middlesex: the Yiewsley Palaeolithic Sites. Stationery Office Books (TSO).

Colonge, D., Bertran, P., Brenet, M., Busseuil, N., Chalard, P., Chopin, J.F., Claud, E., Dayrens, O., Galibert, P., Hernandez, M., Lelouvier, L.A., Mercier, N., Mourre, V., Normand, Ch., Pasquet, V., Prodeo, F., Rechin, F., Rouzo, P., 2012a. A65, Auriac, Duclos; Pleistocene moyen et Antiquite en Bearn. Rapport final d'operation de fouille preventive. Inrap Grand Sud-Ouest, Bordeaux, CSRA Aquitaine, 475 p.

Colonge, D., Lelouvier, L.A., Normand, Ch, Mourre, V., 2012b. Approvisionnement et econmie des matieres premieres dans l'Acheuleen du piemont occidental des Pyrennees. In: Marchand, G., Querre, G. (Eds.), Roches et societ es de la Prehsitoire: entre massifs cristallins et bassins sedimentaires. Actes du colloque de Rennes 2010. Presse Universitaire de Rennes, pp. 53e65.

Colonge, D., Hernandez, M., Lelouvier, L.-A., Mercier, N., Mourre, V., 2014. Paleolithique ancien et Paleolithique moyen ancien dans le piemont pyren een occidental: relations entre chaînes operatoires, continuites et ruptures. In: actes du XXVIIe congres de la SPF, pp. 119e137.

Commont, V., 1909. Saint-Acheul et Montieres. Notes de Geologie, de Paleontologie et de Prehistoire. Memoires de la Societe Geologique du Nor d.

Commont, V., 1911. Les gisements prehistoriques de Saint-Acheul et de Montieres. In: Notes de Prehistoire publiees dans le Bulletin de la Societe linneenne du Nord de la France de 1905 a 1910. Amiens.

Commont, V., 1912. Mousterien a faune chaude dans la vallee de la Somme a Montieres-les-Amiens. In: Compte-Rendu de La 14 Session Du Congres International d'Anthropologie et d'Archeologie Prehistorique. Geneve, pp. 291e300.

Compton, T., Stringer, C., 2012. The human remains. In: Aldhouse Green, S., Peterson, R., Walker, E.A. (Eds.), Neanderthals in Wales: Pontnewydd and the Elwy Valley Caves. University of Wales Press & National Museums and Galleries of Wales, Cardiff, pp. 118e230.

Conard, N.J., 1992. To€nchesberg and its Position in the Palaeolithic of Northern Europe (Monographi. ed).

Condemi, S., Voisin, J.-L., Belmaker, M., Moncel, M.-H., 2010. Revisiting the question of Neandertal regional variability: a view from the Rhone Valley corridor. Col^ legium antropologicum 34, 787e796.

Corbey, R., Roebroeks, W., 2001. Studying Human Origins: Disciplinary History and Epistemology. Amsterdam University Press.

Cordy, J.-M., 1984. Evolution des faunes quaternaires en Belgique. In: Cahen, D., Haesaerts, P., Watteyne, D. (Eds.), Peuples Chasseurs de La Belgique Prehistorique Dans Leur Cadre Naturel. Institut Royal des Sciences naturelles de Belgique, Bruxelles, pp. 67e77.

Cordy, J.-M., Carpentier, G., Lautridou, J.-P., 2003. Les paleo-estuaires du stade isotopique 7 a Tourville-La-riviere et a Tancarville (Seine): faune de rongeurs et cadre stratigraphique. Quaternaire 14, 15e23.

Coudenneau, A., 2013. Elements triangulaires et armes de chasse au Paleolithique moyen. Aix-Marseille Universite.

Coulson, S.D., 1990. Middle Palaeolithic Industries of Great Britain (Studies in. ed).

Coutard, S., Cliquet, D., 2005. Chronostratigraphie des formations pleistocenes et peuplement paleolithique en contexte littoral: le Val de Saire (Normandie). Bulletin de la Societ e prehistorique française 477e499.

Coutard, S., Juhel, L., ViLgrain, G., 2002. Formations quaternaires et industries de la Pointe de Jardeheu a Digulleville (Manche). In: Cliquet, D. (Ed.), 2002, Projet collectif de recherche “Paleolithique de Basse-Normandie”. Rapport d'activites 2001, Premiere annee de recherche, pp. 45e49.

Cubuk, G., 1975. Der altpal€aolithische Fundplatz im Carriere Helin bei St. Symphorien (Belgien). Archa€ologisches Korrespondenzblatt 5, 253e261.

Darlas, A., 1994. L'Acheuleen final des couches superieures de la grotte du Lazaret (Nice, Alpes-Maritimes). L'Anthropologie 98, 267e304.

Davis, R.J., 2014. Palaeolithic archaeology of the Solent River: human settlement history and technology (PhD thesis). University of Reading, Department of Archaeology (School of Archaeology, Geography and Environmental Sciences).

Debard, E., Pastre, J.F., 1988. Un marqueur chronostratigraphique du Pleistocene moyen a la peripherie du Massif Central: la retombee a clinopyroxene vert du Sancy dans le site acheuleen d’Orgnac III (Bas-Vivarais, SE France. CRAS 306, 1515e1520.

De Givenchy, P., 1911. Les grands Eclats Mousteriens et les Pieces Acheuleomousteriennes de la carriere du Tillet, pres La Ferte-sous-Jouarre (Seine-etMarne). Bulletin de la Societe prehistorique de France 8, 257e264.

De Heinzelin, J., 1959. Stratigraphie de la Carriere Helin sur la base des resultats de la campagne de fouilles de 1958. Bulletin de l'Institut Royal des Sciences naturelles de Belgique 35, 1e27.

De Heinzelin, J., Haesaerts, P., 1983. Un cas de debitage laminaire au Paleolithique ancien: Croix-l'Abbea Saint-Valery-sur-Somme. Gallia prehistoire 26, 189e201.

De Heinzelin de Braucourt, J., 1950. Stratigraphie du gisement paleolithique d'Otrange sur la base des resultats de la compagne de fouilles de 1948. Bulletin de l'Institut Royal des Sciences naturelles de Belgique 26, 1e32.

De Heinzelin, J., Dupuis, C., Haesaerts, P., 1975. Paleolithique de la Cuesta d'Harmignies (trouvailles dispersees). Helinium 15, 3e13.

Delagnes, A., 1990. Analyse technologique de la methode de debitage de l’abri Suard (La Chaise-de-Vouthon, Charente). Paleo 2, 81e88.

De Loe€, A., 1883. Le trou Sandron ou l'abri-sous-roche de Huccorgne. Annales du Cercle hutois des Sciences et des Beaux-Arts 5e6, 89e101.

De Loecker, D., 2006. Beyond the Site: the Saalian Archaeological Record at Maastricht-belvedere, the Netherlands. University of Leiden.

De Loecker, D., Roebroeks, W., 2012. Beyond “15-minutes”: revisiting the late Middle Pleistocene archaeological record of Maastricht-Belvedere (The Netherlands). In: Analecta Praehistoricae Leidensia, 43/44. University of Leiden, pp. 351e369.

De Lumley, H., Gregoire, S., Barsky, D., Batalla, G., Bailon, S., Belda, V., Briki, D., Byrne, L., Desclaux, E., El Guenouni, K., Fournier, A., Kacimi, S., Lacombat, F., de Lumley, M.A., Moigne, A.M., Moutoussamy, J., Paunescu, C., Perrenoud, C., Pois, V., Quiles, J., Rivals, F., Roger, T., Testu, A., 2004. Habitat et mode de vie des chasseurs paleolithiques de la Caune de l'Arago (600 000-400 000 ans) Habitat et mode. Anthropologie 108, 159e184. http://dx.doi.org/10.1016/j.anthro.2004.05.001.

De Mortillet, G., 1873. Classification des diverses periodes de l'^age de la pierre, par Gabriel de Mortillet. Typ. de Weizenbach. In: Extrait du compte rendu du congres international d'anthropologie et d'arc heologie prehistoriques 6me session, Brux: 1872.

De Mortillet, G., 1883. Le Prehistorique, antiquite de l'homme (Ch. Ferdinand Reinwald).

De Puydt, M., 1922. Liege paleolithique. Le gisement de Sainte-Walburge dans le limon hesbayen. Note complementaire n I. Bulletin de l'Institut archeologique liegeois 47, 1e13.

De Puydt, M., Hamal-Nandrin, J., Servais, J., 1912. Liege paleolithique. Le gisement de Sainte-Walburge dans le limon hesbayen. Bulletin de l'Institut Archeologique Liegeois 42, 139e215.

De Warrimont, J.P., Stassenstraat, P., 2007. Prospecting Middle Palaeolithic open-air sites in the Dutch-Belgian border area near Maastricht. PalArch's Journal of Archaeology of Northwest Europe 1, 40e89.

Dean, D., Hublin, J.-J., Holloway, R., Ziegler, R., 1998. On the phylogenetic position of the pre-Neandertal specimen from Reilingen, Germany. Journal of Human Evolution 34, 485e508.

Debenath, A., 1974a. Position statigraphique des restes humains antewurmiens de Charente. Bulletins et Memoires de la Soci et e d'anthropologie de Paris. http://dx.doi.org/10.3406/bmsap.1974.2100.

Debenath, A., 1974b. Recherches sur les terrains quaternaires charentais et les industries qui leur sont associees. Universite de Bordeaux, 1, Bordeaux. These de doctorat d’Etat es Sciences, 680 p.

Debenath, A., 1989. L'occupation humaine dans la vallee de la Tardoire au cours de l'Avant-Dernier Glaciaire et du Dernier Interglaciaire. In: Laville, H. (Ed.), Variations Des Paleomilieux et Peuplement Prehistorique, pp. 135e142.

Deeben, J., Hiddink, H., Huisman, D.J., Müller, A., Schokker, J., Wallinga, J., 2010. Middle Palaeolithic artefact migration due to periglacial processes; a geological investigation into near-surface occurrence of Palaeolithic artefacts (LimburgEastern Brabant coversand region, the Netherlands). Netherlands Journal of Geosciences 89, 35e50.

Delagnes, A., 1992a. L'organisation de la production lithique au Paleolithique moyen e Approche technologique a partir de l'etude des industries de la Chaise-deVouthon (Charente). Universite de Paris X, Nanterre.

Delagnes, A., 1992b. L'organisation de la production lithique au Paleolithique moyen - Approche technologique a partir de l'etude des industries de la Chaise-deVouthon (Charente). Universite de Paris X - Nanterre, these de doctorat, 386 p.

Delagnes, A., 1993. Un mode de production inedit au Pal eolithique moyen dans l'industrie du niveau 6e du Pucheuil (Seine-Maritime). Paleo. http://dx.doi.org/ 10.3406/pal.1993.1106.

Delagnes, A., Ropars, A., 1996. Paleolithique moyen en pays de Caux (Haute-Normandie). Le Pucheuil, Ettouteville: deux gisements de plein air en milieu lœssique (Documents d'Archeologie Française).

Delpech, F., Prat, F., 1995. Nouvelles observations sur les faunes acheuleennes de Combe Grenal (Domme, Dordogne). Paleo 7, 123e155.

Delpech, F., Geneste, J.-M., Rigaud, J.-P., Texier, J.-P., 1995. Les industries anterieures a la derniere glaciation en Aquitaine septentrionale: chronologie, paleoenvironnements, technologie, typologie et economie de subsistance. Paleo. Suppl ement. http://dx.doi.org/10.3406/pal.1995.1391.

Detrain, L., Bats, J.-C., Bertran, P., Colonge, D., Fourloubey, C., Grigoletteo, F., Lenoble, A., L'Homme, X., 2005. Neuvic-sur-l'Isle (Dordogne), DFS de fouille, A89 Section 2. 3 (Serie evaluation).

Di Modica, K., 2004. La Grotte de l'Hermitage: nouvelles approches et reinterpretation d'un site classique du Paleolithique ancien mosan. Nota e Praehistoricae 24, 47e55.

Di Modica, K., 2009. La carriere Heli n a Saint-Symphorien. In: Di Modica, K., Jungels, C. (Eds.), Paleolithique Moyen En Wallonie. La Collection Louis Eloy. Service du Patrimoine culturel de la Communaute française, Bruxelles, pp. 93e109.

Di Modica, K., 2010. Les productions lithiques du Paleolithique moyen de Belgique : Variabilite des systemes d'acquisition et des technologies en reponse a une mosaïque d'environnements contrastes. Universite de L iege e Museum National d'Histoire Naturelle, Liege.

Di Modica, K., 2011. La documentation du Paleolithique moyen en Belgique aujourd’hui, etat de la question. In: Toussaint, M., Di Modica, K., Pirson, S. (Eds.), Le Pa leolithique moyen en Belgique. Melanges Marguerite Ulrix-Closset, L iege, pp. 75e104.

Di Modica, K., Jungels, C., 2009. Le gisement paleolithique d'Otrange. In: Di Modica, K., Jungels, C. (Eds.), Paleolithique Moyen En Wallonie. La Collectio n Louis Eloy. Service du Patrimoine culturel de la Communau te française, Bruxelles, pp. 134e143.

Dibble, H.L., 1995. Middle paleolithic scraper reduction: Background, clarification, and review of the evidence to date. Journal of Archaeological Method and Theory 2, 299e368. http://dx.doi.org/10.1007/BF02229003.

Dibble, H.-L., Bar-Yosef, O., 1995. The Definition and Interpretation of Levallois Technology. Prehistory Press, Madison. Monographs in World Archeology, 23.

Dibble, H.L., Dibble, H.L., Chase, P.G., Chase, P.G., McPherron, S.P., McPherron, S.P., Tuffreau, A., Tuffreau, A., 1997. Testing the reality of a “Living floor” with archaeological data. American Antiquity 62, 629e651. http://dx.doi.org/ 10.2307/281882.

Djema, H., 2008. Le Paleolithique moyen-ancien de la Corniche cantabrique et du Bassin aquitain, ou le phenomene culturel des premiers neanderthaliens: analyse techno-economique comparative de gisements cantabriques et perigourdins. Universite de Paris I.

Draily, C., 2011a. La grotte Walou a Trooz (Belgique). Fouilles de 1996 a 2004. In: L'Archeologie, Etudes et Documents e Archeologie, vol. 3. Institut du Patrimoine Wallon, Namur.

Draily, C., 2011b. Les occupations mousteriennes de la grotte Walou (Trooz). In: Toussaint, M., Di Modica, K., Pirson, S. (Eds.), Le Paleolithique moyen en Belgique. Melanges Marguerite Ulrix-Closset, Liege, pp. 343e351.

Durbet, G., Rodriguez, P., Badalian, L., Hadjouis, D., Gauthier, A., Laurent, M., Ricard, J.-L., Wattez, J., 1997. Decouverte d'un site Paleolithique moyen dans des alluvions saaliennes du confluent Seine-Marne Maisons-Alfort (Val-de-Marne). Comptes rendus de l'Academie des sciences. Serie 2. Sciences de la terre et des planctes 324, 505e512.

Eissmann, L., 1983. Die Quart€argeologie des Raumes Markkleeberg südlich von Leipzig. In: Baumann, W., Mania, D. (Eds.), Die Pala€olithischen Neufunde von Markkleeberg Bei Leipzig. Vero€ffentlichungen Des Landesmuseum Für Vorgeschichte, Dresden, pp. 37e48.

Ertmer, S., 2012. Grabungen in der Parkkiesgrube Hundisburivreg, Ldkr. Bo€rde, Sachsen-Anhalt. BUFM 66, 53e67.

Escutenaire, C., 1996. Etude technologique des industries de la Carriere Helin, site du Paleolithique moyen en Belgique. Notae Praehistoricae 16, 7e23.

Faivre, J.-P., Geneste, J.-M., Turq, A., 2010. La fracturation en split, une technique de production dans l'industrie lithique des Tares (Sourzac, Dordogne). In: Mourre, V., Jarry, M. (Eds.), 2009e2010: Entre Le Marteau et L'enclume. Paleo, pp. 133e142.

Faivre, J.-P., Maureille, B., Bayle, P., Crevecoeur, I., Duval, M., Grün, R., Bemilli, C., Bonilauri, S., Coutard, S., Bessou, M., Limondin-Lozouet, N., Cottard, A., Deshayes, T., Douillard, A., Henaff, X., Pautret-Homerville, C., Kinsley, L., Trinkaus, E., 2014. Middle pleistocene human remains from Tourville-la-Riviere (Normandy, France) and their archaeological context. PLoS One 9, e104111. http://dx.doi.org/10.1371/journal.pone.0104111.

Falgueres, C., Shen, G., Yokoyama, Y., 1988. Datation de l'aven d'Orgnac III: comparaison par les methodes de la resonnance de spin electronique (ESR) et d u desequilibre des familles de l'Uranium. L'Anthropologie, Paris 92 (2), 727e730.

Falgueres, C., de Lumley, H., Bischoff, J.L., 1992. U-Series dates for stalagmitic flowstone E (Riss/Würm interglaciation) at Grotte du Lazaret, Nice, France. Quaternary Research 38, 227e233.

Falgueres, C., Bahain, J.-J., Saleki, H., 1997. U-series and ESR dating of teeth from Acheulian and Mousterian levels at La Micoque (Dordogne, France). Journal of Archaeological Science 24, 537e545. http://dx.doi.org/10.1006/jasc.1996.0137.

Falgueres, C., Yokoyama, Y., Shen, G., Bischoff, J.L., Ku, T.L., de Lumley, H., 2004. New U-series dates at the Caune de l'Arago, France. Journal of Archaeological Science 31 (7), 941e952.

Fiedler, L., 1994. Alt- und mittelsteinzeitliche Funde in Hessen. Führer zur Hessischen Vor- und Frühgeschichte. Theiss-Verlag, Stuttgart.

Folgado, M., Brenet, M., Sellami, F., Bertran, P., Rios Garaizar, J., Guibert, P., Vieillevigne, E., 2005. Economie de façonnage et de debitage sur le gisement du Paleolithique ancien de Combe Brune 3. Rapport Final d'operation. (inrap).

Fontana, F., Moncel, M.-H., Nenzioni, G., Onorevoli, G., Peretto, C., Combier, J., 2013. Widespread diffusion of technical innovations around 300,000 years ago in Europe as a reflection of anthropological and social transformations?New comparative data from the western Mediterranean sites of Orgnac (France) and Cave dall'Olio (Italy). Journal of Anthropological Archaeology 32, 478e498. http://dx.doi.org/10.1016/j.jaa.2013.08.003.

Forestier, H., 1993. Le Clactonien: mise en application d'une nouvelle methode de debitage s'inscrivant dans la variabilite des systemes de production lithique du Paleolithique ancien. Paleo 5, 53e82.

Fraipont, J., Tihon, F.-J., 1896. Explorations scientifiques des cavernes de la vallee de la Mehaigne, pp. 3e51. Memoires couronnes et autres memoires publies par l'Academie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique 54.

Frechen, M., Brückner, H., Radtke, U., 1992. A comparison of different TL-techniques on loess samples from rheindahlen (F.R.G.). Quaternary Science Reviews 11, 109e113.

Frouin, M., Lahaye, C., Hernandez, M., Mercier, N., Guibert, P., Brenet, M., FolgadoLopez, M., Bertran, P., 2014. Chronology of the Middle Palaeolithic open-air site of Combe Brune 2 (Dordogne, France): a multi luminescence dating approach. Journal of Archaeological Science 52, 524e534. http://dx.doi.org/10.1016/j.jas.2014.09.012.

Gadebois, G., 2006. Therdonne. Etude technologique et technique de la production de pointe Levallois et declats triangulaires: un aspect comportemental des modalites de gestion lithique des Neanderthaliens. Universite des Sciences et Technologies de Lille, Villeneuve-d'Ascq.

Gagnepain, J., Gaillard, C., 2005. La grotte de la Baume Bonne (Quinson, Alpes de Haute-Provence): synthese chronostratigraphique et sequence culturelle d'apres les fouilles recentes (1988e1997). In: Donnees recentes sur les modalites de peuplement et sur le cadre chronostratigraphique geologique et paleoanthropologique des industries du Paleolithique inferieur et moyen en Europe, Colloque International de Rennes, septembre 2003.

Gaillard, C., 1982. L'industrie lithique du Paleolithique inferieur et moyen de la grotte de Coupe-Gorge a Montmaurin (Haute-Garonne). Gallia prehistoire 25, 79e105.

Gaillard, C., 1983. Matieres premieres de l'industrie lithique de la grotte de CoupeGorge a Montmaurin (Haute-Garonne). Bulletin de la Societe prehistorique française 57e64.

Gamble, C., 1999. The Palaeolithic Societies of Europe. Cambridge University Press.

Garreau, S., 1998. Analyse technologique de l'industrie lithique acheuleenne du site les Pendus (Creysse, Dordogne): caracterisation et comparaison des schemas operatoires de debitage et de façonnage. Universite de Paris X, Nanterre.

Garreau, S., 2000. Etude technologique de l'industrie lithique acheuleenne du site des Pendus (Creysse, Dordogne. In: Boe€da, E., Guillomet-Malmassari, V. (Eds.), Des Comportements Techniques Dans La Prehistoire, Table Ronde Du Laboratoire de Prehistoire et Technologie, Ateliers N 2. laboratoire d'Ethnologie et Sociologie comparative, pp. 7e28.

Geneste, J.-M., 1985. Analyse lithique d'industries mousteriennes Perigord: une approche technologique du comportement des groupes humains au Paleolithique moyen. Universite de Bordeaux I.

Geneste, J.-M., 1988. Les industries de la grotte Vaufrey: technologie du debitage, economie et circulation de la matiere premiere lithique. In: Rigaud, J.-P. (Ed.), L a Grotte Vaufrey: Paleoenvironnement, Chronologie, Activites Humaines. Societe Prehistorique Française, pp. 441e518.

Geneste, J.-M., Plisson, H., 1996. Production et utilisation de l'outillage lithique dans le Mousterien du Sud-ouest de la France: Les Tares a Sourzac, vallee de l'Isle, Dordogne. In: Bietti, A., Grimaldi, S. (Eds.), Reduction Processes (“chaînes Operatoires”) for the European Mousterian, Actes Du Colloque International de Rome. Quaternaria Nova, VI, Rome, may 26-28 1995, pp. 343e368.

Geyh, M. a., Krbetschek, M., 2012. Zum Radiometrischen Alter Des Holstein-Interglazials. In: Die Chronologische Einordnung Der Pala€olithischen Fundstellen von Scho€ningen.

Gibbard, P., 2007. Palaeogeography: Europe cut adrift. Nature. http://dx.doi.org/10.1038/448259a.

Giot, P.-R., Bordes, F., 1955. L'abri sous roche paleolithique de Grainfollet a SaintSuliac: Ille-et-Vilaine. L'Anthropologie 59, 205e234.

Goubel, H., 2011. Analyse de contour dentaire des ursides pleistocenes et actuels: caracterisation et etude des causes de la variabilite morphologique des dent s jugales. These de doctorat. Universite des Sciences et Technologies de Lille 1, Villeneuve-d'Ascq.

Goval, E., 2005. Contribution a l'identification du passage du paleolithique inferieur au paleolithique moyen a partir du materiel lithique du gisement du Mont de l'Evangile de Gentelles (Somme, France). Universite des Sciences et Technologies de Lille.

Goval, E., Herisson, D., 2012. Decouverte inedite de trois occupations du Pleniglaciaire moyen du Weichselien a Havrincourt «Les Bosquets» (Pas-de-Calais, France). Bulletin de la Societ e prehistorique française 109, 342e345.

Goval, E. dir., Herisson, D., Antoine, P., Jamet, G., Coutard, S., Auguste, P., Claud, E., Boitard-Bidaut, E., Debenham, N., 2013. Les occupations de la fin du Paleolithique moyen au debut du Paleolithique superieur a Havrincourt «les Bosquets» (Pas-de-Calais). Rapport de la fouille 22 du Canal Seine-Nord Europe, SRA Nord-Pas-de-Calais.

Grahmann, R., 1955. The lower palaeolithic site of Markkleeberg and other comparable localities near Leipzig. Transactions of the American Philosophical Society N. S 45, 609e687.

Greened, H.S., 1984. Pontnewydd Cave: a Lower Palaeolithic Hominid Site in Wales: the First Report. Sutton Pub Limited.

Groenendijk, A.J., Meijs, E.P., Gullentops, F., Bringmans, P.M.M.A., Vermeersch, P.M., 2001. Overview of the stratigraphy and the archaeological levels in the Nelissen brickyard quarry at Kesselt (Belgium). In: Bringmans, P.M.M.A. (Ed.), Stratigrahy and Prehistory of the River Maas Valley in Limburg e Belgium. Excursion Guide. XIVth UISPP Congress, 2e8 September 2001, Liege, Belgium. Katholieke Universiteit Leuven/I.A.P./Gallo-Roman Museum of Tongeren, Leuven, pp. 15e20.

Grün, R., Stringer, C.B., 1991. Electron Spin Resonance dating and the evolution of modern humans. Archaeometry 33, 153e199. http://dx.doi.org/10.1111/j.14754754.1991.tb00696.x.

Grün, R., Mellars, P., Laville, H., 1991. ESR chronology of a 100,000-ýear archaeological sequence at Pech de l'Aze II, France. Antiquity 65, 544 e551. http://dx.doi.org/10.1017/S0003598X00080157.

Guerlin, O., Deschodt, L., Lamotte, A., Locht, J.-L., Antoine, P., 2008. Le gisement de Revelles « les Terres-Sellier ».

Guibert, P., Lahaye, C., Duttine, M., Bechtel, F., 2006. TL-dating of Mousterian open air sites of the Isle valley: Les Fore^ts and Petit Bost (Dordogne, France). In: 34th International Symposium on Archaeometry. Centro de Estudios Borjanos, pp. 67e72.

Guibert, P., Bechtel, F., Bourguignon, L., Brenet, M., Couchoud, I., Delagnes, A., Delpech, F., Detrain, L., Duttine, M., Folgado, M., 2008. Une base de donnees pour la chronologie du paleolithique moyen dans le Sud-Ouest de la France. In : Jaubert, J., Bordes, J.-G., Ortega, I. (Eds.), Les Societes Du Paleolithique Dans Un Grand Sud-Ouest: Nouveaux Gisements, Nouveaux Resultats, Nouvelles Methodes. Memoires de la Societe prehistorique française, XLVII (Journees SPF, Universite Bordeaux 1, Talence, 24-25 novembre 2006), pp. 19e40.

Guichard, J., Guichard, G., 1966. A propos d'un site Acheuleen du Bergeracois (Les Pendus, Commune de Creysse). Bifaces-hachereaux et hachereaux sur eclats. Aperçu typologique. Actes de la Societe Linneenne de Bordeau 103, 2e14.

Guilbaud, M., Carpentier, G., 1995. Un remontage exceptionnel a Tourville-la-Riviere (Seine-Maritime). Bulletin de la Societe prehistorique française 92, 289e295.

Guipert, G., 2005. Reconstitution et position phyletique des restes cra^niens de l'Homme de Tautavel (Arago 21e47) et de Biache-Saint-Vaast 2. Apports de l'imagerie et de l'analyse tridimensionnelles. Universite Paul Cezanne AixMarseille III.

Guipert, G., de Lumley, M.-A., Tuffreau, A., Mafart, B., 2011. A late Middle Pleistocene hominid: Biache-Saint-Vaast 2, North France. Comptes Rendus Palevol 10, 21e33. http://dx.doi.org/10.1016/j.crpv.2010.10.006.

Gullentops, F., 1991. Non-orbital-forced sedimentation cycles in the recent past. In: Vanderborght, Z. (Ed.), IGBP-Related Research in Belgium. Royal Belgian Academy of Sciences, Brussel, pp. 97e99.

Gupta, S., Collier, J.S., Palmer-Felgate, A., Potter, G., 2007. Catastrophic flooding origin of shelf valley systems in the English Channel. Nature 448, 342e345.

Gysels, J., Cahen, D., 1981. Premiers resultats de l'analyse des traces microscopiques d'usure de quelques outils de Mesvin IV. Notae Praehistoricae 1, 75e82.

Hadjouis, D., 1998. Le cheval de Maisons-AIfort (Val-de-Marne, France) et ses rapports avec les chevaux du Pleistocene moyen et superieur d'Europe (The horse of Maisons-AIfort (Val-de-Marne, France) and his relationships with middle and upper european pleistocene horses). Quaternaire 337e343.

Haesaerts, P., 1974. Sequence paleoclimatique du Pleistocenesuperieur du bassin de la Haine (Belgique). Annales de la Societ e geologique de Belgique 97, 105e137.

Haesaerts, P., 1978. Contexte stratigraphique de quelques gisements paleolithiques de plein air de Moyenne Belgique. Bulletin de la Societ e Royal belge de l'Anthropologie et Prehistoire 89, 115e133.

Haesaerts, P., Van Vliet, B., 1974. Compte rendu de l'excursion du 25 mai 1974 consacree a la stratigraphie des limons aux environs de Mons. Annales de la Societe geologique de Belgique 97, 547e560.

Haesaerts, P., Juvigne, E., Kuyl, O., Mucher, H., Roebroeks, W., 1981. Compte rendu de l'excursion du 13 Juin 1981, en hesbaye et au Limbourg Neerlandais, consacree a la chronostratigraphie des loess du Pleistocene superieur. Annales de la Societe Geologique de Belgique 104, 223e240.

Haesaerts, P., van der Sloot, P., Leotard, J.-M., 2008. Sondages archeologiques au sein des depo^ts du Pleistocene superieur preserves sur le Mont Saint-Martin a Liege. Notae Praehistoricae 28, 21e31.

Hatch, M., 2014. The Pleistocene Solent River and its Major Tributaries: Reinterpreting the Fluvial Terrace Stratigraphy as a Framework for the Palaeolithic Archaeology of the Region. University of London.

Heim, J., Lautridou, J.-P., Maucorps, J., Puissegur, J.-J., Somme, J., Thevenin, A., 1982. Achenheim: une sequence-type des loess du Pleistocene moyen et superieur. Bulletin de l'Association française pour l'etude du quaternaire 19, 147e159.

Heinrich, W.D., 1981. Zur stratigraphischen Stellung der Wirbeltierfaunen aus den Travertinfundsta€tten von Weimar-Ehringsdorf und Taubach in Thüringen. Zeitschrift für Geologische Wissenschaften 9, 1031e1055.

Herisson, D., 2012. Etude des comportements des premiers Neandertaliens du Nord de la France: les occupations saaliennes des gisements de Biache-Saint-Vaast et de Therdonne. These de doctorat. Universite de Lille, Villeneuve-d'Ascq.

Herisson, D., Goval, E., 2013. Du Paleolithique inferieur au debut du Paleolithique superieur dans le Nord de la France: lumiere sur les premieres decouvertes du Canal Seine-Nord Europe. In: Notae Praehistoricae, pp. 91e104.

Herisson, D., Locht, J.-L., 2014. Le niveau N3 de Therdonne: reflet de la diversite des technocomplexes du Paleolithique moyen ancien du Nord de la France. In: Brenet, M., Bourguignon, L., Jarry, M. (Eds.), Emergence et Diversite Des TechnoComplexes Du Paleolithique Moyen Ancien. Relations Entre Productions de Debitage et de Façonnage., Session C Du XXVIIe Congres Prehistorique de France, 31 Mai e 5 Juin 2010. Societe Prehistorique Française, Bordeaux e Les Eyzies, pp. 43e58.

Herisson, D., Locht, J.-L., Auguste, P., Tuffreau, A., 2013. N eandertal et le feu au Paleolithique moyen ancien. Tour d'horizon des traces de son utilisation dans le Nord de la France. Neanderthal and fire during Early Middle Palaeolithic. Overview of its use traces in Northern France. L'Anthropologie 117, 541e578. http://dx.doi.org/10.1016/j.anthro.2013.10.002.

Herisson, D. dir., Goval, E., Antoine, P., Bahain, J.-J., Balescu, S., Chantreau, Y., Claud, E., Coutard, S., Debenham, N., Font, C., Locht, J.-L., Pirson, S., Spagna, P., 2015. Les occupations du Paleolithique inferieur et du Paleolithique moyen d'Etricourt-Manancourt, Canal Seine Nord Europe. Rapport de fouille, SRA de Picardie.

Herisson, D., Coutard, S., Goval, E., Locht, J.-L., Antoine, P., Chantreau, Y., Debenham, N., 2016. A new key-site for the end of Lower Palaeolithic and the onset of Middle Palaeolithic at Etricourt-Manancourt (Somme, France). Quaternary International 409, 73e91. http://dx.doi.org/10.1016/ j.quaint.2016.01.055.

Hernandez, M., Mercier, N., Rigaud, J.-P., Texier, J.-P., Delpech, F., 2014. A revised chronology for the Grotte Vaufrey (Dordogne, France) based on TT-OSL dating of sedimentary quartz. Journal of human evolution 75, 53e63. http://dx.doi.org/ 10.1016/j.jhevol.2014.05.010.

Hosfield, R., 2005. Individuals Among Palimpsest Data. The Hominid Individual in Context. Routledge, Abingdon, pp. 220e243.

Hosfield, R.T., Chambers, J.C., 2002. The Lower Palaeolithic site of Broom: geoarchaeological implications of optical dating. Lithics 23, 33e42.

Hosfield, R., Chambers, J., 2009. Genuine diversity?The Broom biface assemblage. In: Proceedings of the Prehistoric Society. Cambridge Univ Press, pp. 65e100.

Hublin, J.-J., 1998. Climatic changes, paleogeography, and the evolution of the Neandetals. In: Akazawa, T., Aoki, K., Bar-Yosef, O. (Eds.), Neandertals and Modern Humans in Western Asia. Plenum Press, New York, pp. 295e310.

Hublin, J.-J., Roebroeks, W., 2009. Ebb and flow or regional extinctions? On the character of Neandertal occupation of northern environments. Comptes Rendus Palevol 8, 503e509.

Huijzer, A.S., 1993. Cryogenic Microfabrics and Macrostrtuctures: Interrelations, Processes, and Paleoenvironmental Significance (Ph.D. thesis). Vrije Universiteit Amsterdam, 245pp.

Hurel, A., Coye, N., 2011. Dans l'epaisseur du temps: archeologues and geologues inventent la prehistoire. Publications scientifiques du museum national d'histoire naturelle.

Hurtrelle, J., Monchy, E., Tuffreau, A., 1972. Le gisement paleolithique ancien de Beaumetz-les-Loges (Pas-de-Calais). Annales de la Societe Geologique du Nord XCII 147e153.

Huxtable, J., Aitken, M.-J., 1988. Datation par Thermoluminescence. In: Tuffreau, A., Somme, J. (Eds.), Le Gisement Paleolithique Moyen de Biache Saint-Vaast (Pas de Calais). Societe Prehistorique Française, pp. 107e108.

Huxtable, J., 1993. Further thermoluminiscence dates for burnt flints from Maastricht-Belvedere and a finalised thermoluminiscence age for Unit IV Middle Palaeolithic sites. Mededelingen Rijks Geologische Dienst 47, 41e44.

Ikinger, E.-M., 2002. Zur formenkundlich-chronologischen Stellung der Rheindahlener Funde: Micoquien, Rheindahlien, MTA? In: Schirmer, W. (Ed.), Lo€sse Und Bo€den in Rheindahlen, pp. 79e138. GeoArchaeoRhein 5, Münster.

Isaac, G.L., 1981a. Stone Age Visiting Cards: Approaches to the Study of Early Land Use Patterns. Patterns of the past. Cambridge University Press, Cambridge, pp. 131e155.

Isaac, G., 1981b. Stone age visiting cards: approaches to the study of early land use patterns. In: Hodder, I., Isaac, G., Hammond, N. (Eds.), Pattern of the Past: Studies in Honour of David Clarke. Cambridge University Press, pp. 131e155.

Jarry, M., 2010. Les groupes humains du Pleistocene moyen et superieur en Midi toulousain: contextes, ressources et comportements entre Massif Central et Pyrenees.

Jarry, M., Lelouvier, L.A., 2014. Diversite et complexite des productions de debitage et de façonnage en Midi toulousain du Paleolithique Inferieur au Paleolithique moyen ancien. In: Actes du XXVIIeme Congres de la SPF, 31 mai 4 juin 2010, Societe Prehistorique Français, pp. 103e118.

Jarry, M., Bertran, P., Colonge, D., Lelouvier, L.-A., Mourre, V., 2004. Le gisement paleolithique moyen ancien des Bosses a Lamagdelaine (Lot, France). In: Actes Du XIVeme Congres de l'UISPP, Liege, 2e8 Sept. 2001, pp. 177e186. BAR International Series.

Jarry, M., Colonge, D., Lelouvier, L.A., Mourre, V., 2007. Les Bosses (Lamagdelaine e Lot e France): un gisement paleolithique moyen inferieur a l'avant-dernier interglaciaire sur la moyenne terrasse du Lot. Bulletin de la Societe Prehistorique Française, Travaux 7.

Jaubert, J., 1984. Contribution a l'etude du Paleolithique ancien et moyen des Causses.

Jaubert, J., 1999. Chasseurs et artisans du Mousterien, Collection Histoire de l a France Prehistorique.

Jaubert, J., Lorblanchet, M., Laville, H., Slott-Moller, R., Turq, A., Brugal, J.-P., 1990. Les chasseurs d'Aurochs de La Borde. Un site Paleolithique moyen (Livernon, Lot). Maison des Sciences de l'Homme, Document d'Archeologie Française, 27. Paris.

Jaubert, J., Kerzavo, B., Bahain, J.-J., Brugal, J.-P., Chalard, P., Falgueres, C.H., Jarry, M., Jeannet, M., Lemorini, C., Louchart, A., Maksud, F., Mourre, V., Quninf, Y., Thiebaut, C., 2005. Coudoulous I (Tour-de-Faure, Lot) site du Pleistocene moyen en Quercy: bilan pluridisciplinaire. In: Molines, N., Moncel, M.-H., Monnier, J.-L. (Eds.), Donnees Recentes Sur Les Modalites de Peuplement et Sur Le Cadre Chronostratigraphique Geologique et Paleoanthropologique Des Industries Du Paleolithique Inferieur et Moyen En Europe, Colloque International de Rennes, Septembre 2003, pp. 227e251. BAR International Series S1364.

Jungels, C., 2004. Etude et comportement mousterien a Otrange: comparaison de deus entites archeologiques. Universite de Liege, Liege.

Jungels, C., 2005. Etude et comportement mousterien a Otrange: comparaison de deux ensembles archeologiques. Anthropologica et Praehistorica 116, 59e98.

Junkmanns, J., 1995. Les ensembles lithiques d'Achenheim d'apres la collection de Paul Wernert. Bulletin de la Societe Prehistoirque Française 92, 26e36.

Justus, A., 2000. Der mittelpala€olithische Fundplatz “In den Wannen”, Kreis MayenKoblenz. Jahrbuch des Ro€misch- Germanischen Zentralmuseums Mainz 47, 155e300.

Kahlke, H.D., 1958. Die jungpleistoz€anen Sa€ugetierfaunen aus dem Travertingebiet von TaubacheWeimareEhringsdorf (Vorbericht). Alt-Thüringen 3, 97e130.

Keen, D.H., 2001. Towards a late Middle Pleistocene non-marine molluscan biostratigraphy for the British Isles. Quaternary Science Reviews 20, 1657e1665. http://dx.doi.org/10.1016/S0277-3791(01)00030-0.

Kennard, A.S., 1944. The Crayford Brickearths. Proceedings of the Geologists' Association 55. http://dx.doi.org/10.1016/S0016-7878(44)80014-1, 121eIN1.

Kerney, M.P., Sieveking, G. de G., 1977. Northfleet. In: Shephard-Thorn, E., Wymer, J. (Eds.), South East England and the Thames Valley. Guide Book for Excursion A. INQUA, pp. 44e46.

Khatib, S., 1994. Datations des cendres volcaniques et analyses geochimiques du remplissage d'Orgnac 3 (Ardeche, France). Quaternaire 5 (1), 13e23.

Koehler, H., 2008. L'apport du gisement des Osiers a Bapaume (Pas-de-Calais) au debat sur l'emergence du Paleolithique moyen dans le Nord de la France. Bulletin de la Societe prehistorique française 105, 709e735.

Koehler, H., 2011. Blade production in the early phase of the Middle Paleolithic at Bapaume-Les Osiers (Pas-De-Calais, France): comments on the Distinction between the early and late phases of the Middle Paleolithic. In: Conard, N.J., Richter, J. (Eds.), Neanderthal Lifeways, Subsistence and Technology. Springer, Netherlands, pp. 111e120. http://dx.doi.org/10.1007/978-94-007-0415-2_11.

Laforge, M., 2012. Le cadre chronostratigraphique des peuplements pleistocenes de l'Ouest de la France: eustatisme, changements climatiques et occupations humaines. Universite Europeenne de Bretagne.

Laforge, M., Bahain, J.-J., Monnier, J.-L., 2014. Cadre chronostratigraphique du gisement paleolithique moyen de Grainfollet (Saint-Suliac, Ille-et-Vilaine). In: Colloque International Q9. Le Quaternaire: Marqueurs, Traceurs et Chronometres, Lyon, 26e28 Mars 2014.

Lahaye, C., 2005. Nouveaux apports de la thermoluminescence a la chronologie du Paleolithique dans le Sud-Ouest de la France. Etudes en milieu heterogene et en presence de desequilibres radioactifs dans les series de l'uranium. Universite Bordeaux 3.

Lahaye, C., Godfrey-Smith, D.I., Guibert, P., Bechtel, F., 2006. Equivalent thermal history (HE) of ferruginous sandstones based on the thermal activation characteristics of quartz. Radiation Measurements 41, 995e1000.

Lamotte, A., 1995. Donnees nouvelles sur l'Acheuleen de l'Europe du Nord-Ouest. Bulletin de la Societ e prehistorique française 92, 193e199.

Lamotte, A., 1999. L'apport des remontages dans la comprehension des m ethodes de debitage et de façonnage des gisements acheul eens de la Somme. Bulletin de la Societ e prehistorique française 96, 117e131. http://dx.doi.org/10.3406/ bspf.1999.10936.

Laurent, M., 1993. Datation par resonance de spin electronique (ESR) de quartz de formations quaternaires: comparaison avec le paleomagnetisme. Museum national d'Histoire naturelle, Paris.

Lautridou, J.-P., Somme, J., Heim, J., Puissegur, J.-J., Rousseau, D.-D., 1985. La stratigraphie des loess et formations fluviatiles d'Achenheim (Alsace): nouvelles donnees bioclimatiques et correlations avec les sequences pleistocenes de la France du Nord-Ouest. Bulletin de l'Association française pour l'etude du quaternaire 125e132.

Lautridou, J.-P., Auguste, P., Carpentier, G., Cordy, J.-M., Lebret, P., Lechaevalier, C., Lefebvre, D., 2003. L'Emien et le Pleistocene moyen recen t fluvio-marin et continentalde la vallee de la Seine de Cleon au Havre (Normandie). Quaternair e 14, 25e30.

Layard, N.F., 1920. The stoke bone-bed, Ipswich. In: Proceedings of the Prehistoric Society of East Anglia, 3, 2. Cambridge Univ Press, pp. 210e219.

Leblanc, E., 1999. Etude des series IIA, II alpha, II base du gisement paleolithique moyen de Biache-Saint-Vaast (Pas-de-Calais): synthese et complement des etudes typologiques et plans de repartition du chantier de 1976. Universite des Sciences et Technologies de Lille, Villeneuve-d'Ascq.

Lebret, P., Dumont, J.L., Gaquerel, C., Huault, M.F., Lautridou, J.P., Le Coustumer, M.N., Lefebvre, D., Levant, M., Masson, B., Puissegur, J.J., 1984. Tancarville: la liaison Pleisto cene moyendPleistocene superieur en Basse Seine. Bulletin de la Centre de Geomorphologie du CNRS, Caen 29, 6 3e84.

Lefrancq, M.G., 1955. Le station paleolithique de la route d'Ath, a Nimy (site du Rissoris). Annales du Cercle archeologique de Mons 62, 31e39.

Lelouvier, L.A., Bosc-Zanardo, B., Bruxelles, L., Chalard, P., Jarry, M., 2012. En Vignes, une halte de chasse tardiglaciaire a Marsan dans le Gers (France). Bulletin de la Societe prehistorique française 109 (1), 105e119.

Leroy, G., 1990. Definition d'une methode de reconstitution graphique de paleoenvironnements et son application a la sequence pleisto cene moyen de Biache-Saint-Vaast. Universite des Sciences et Technologies de Lille, Villeneuved'Ascq.

Lhomme, V., 2007. Tools, space and behaviour in the Lower Palaeolithic: discoveries at Soucy in the Paris basin. Antiquity 81, 536e554.

Lhomme, V., Connet, N., 2001. Observations sur les pieces bifaciales et les chaînes operatoires de façonnage dans les sites pleistocenes moyen de Soucy (Yonne), in D. Cliquet dir., Les industries a outils bifaciaux du Paleolithique moyen d'Europe occidentale. In: Actes de la table-ronde internationale organisee a Caen, 14 et 15 octobre 1999, ERAUL 98, 43 a 50.

Lhomme, V., Bemilli, C., Beyries, S., Christensen, M., Connet, N., 1998a. Soucy 1 (Yonne): interpretations et reflexions sur un site du Pleistocene moyen en contexte alluvial. In: Brugal, J.P., Meignen, L., Patou-Mathis, M. (Eds.), Economie prehistorique: Les comportements de subsistance au Paleolithique. XVIIIe Rencontres Internationales d'Archeologie et d'Histoire d'Antibes, Association pour la Promotion et la Diffusion des Connaissances Archeologiques, Sophia Antipolis, France, pp. 260e271.

Lhomme, V., Bemilli, C., Chausse, C., Connet, N., van Kolfschoten, T., LimondinLozouet, N., 1998b. Le gisement paleolithique inferieur de Soucy 5 (Yonne). Revue archeologique de l'Est 49, 5e30.

Lhomme, V., Connet, N., Bemilli, C., Chausse, C., Beyries, S., Guerin, C., 2000a. Essai d'interpretation du site paleolithique in ferieur de Soucy 1 (Yonne). Gallia prehistoire 42, 1e44.

Lhomme, V., Bemilli, C., Chausse, C., Connet, N., 2000b. Soucy 3, bilan intermediaire de l'etude, rapport d'etude, service regional de l'archeologie de Bourgogne. Dijon, decembre2000.

Lhomme, V., Rocca, R., Sellier, N., 2002. Clairy-Saulchoix e A.29 Le Champ Mugotte e Au Chemin de Pissy. In: Bilan Scientifique de La Region Picardie, Annee 2002, p. 104.

Lhomme, V., Connet, N., Chausse, C., Bemilli, C., Bahain, J.-J., Voinchet, P., 2004. Les sites et les industries lithiques du Paleolithique inferieur, moyen et superieur de la basse vallee de l'Yonne dans leurs contextes chronostratigraphiques. Bilan de dix ans d'activite archeologique pluridisciplinaire dans le sud-est du Bassin parisien. Bulletin de la Societe prehistorique française 701e739.

Liouville, M., 2007. Variabilite du Cerf elaphe (Cervus elaphus Linne 1758) au cours du Pleistocene moyen et superieur en Europe occidentale: approches morphologiques, paleoecologiques et cynegetiques. These de doctorat. Museum national d'Histoire naturelle, Paris.

Lisiecki, L.E., Raymo, M.E., 2005. A Pliocene-Pleistocene stack of 57 globally distributed benthic d18O records. Paleoceanography 20, PA1003. http://dx.doi.org/10.1029/2004pa001071.

Litt, T., Behre, K.E., Meyer, K.-D., Stephan, H.-J., Wansa, S., 2007. Stratigraphische Begriffe für das Quarta€r des Norddeutschen Vereisungsgebietes. Eiszeitalter und Gegenwart 56, 7e65.

Locht, J.-L., 1990. Etude technologique et typologique du site paleolithique moyen du Rissori a Masnuy-St-Jean. Memoires de Prehistoire Liegeoise.

Locht, J.-L., 2004. Le gisement paleolithique moyen de Beauvais (Oise). Universite des Sciences et Technologies de Lille 1, Villeneuve-d'Ascq.

Locht, J.-L., Kiefer, D., 2009. Drucat (Somme). “Au bout de Drucat,”. Rapport de diagnostic. INRAP, SRA Picardie.

Locht, J.-L., Swinnen, C., 1994. Le debitage discoïde du gisement de Beauvais (Oise): aspect de la chaîne operatoire au travers de quelques remontages. Paleo 6, 89e104.

Locht, J.-L., Antoine, P., Swinnen, C., 1995. Le gisement paleolithique de PlachyBuyon (Somme). Revue archeologique de Picardie 3, 3e33.

Locht, J.-L., Guerlin, O., Antoine, P., Debenham, N., 2000. Therdonne. “Le Mont de Bourguillemont,” Document Final de Synthese. AFAN, SRA Picardie.

Locht, J.-L., Antoine, P., Herisson, D., Gadebois, G., Debenham, N., 2010. Une occupation de la phase ancienne du Paleolithique moyen a Therdonne (Oise). Chronostratigraphie, production de pointes Levallois et reduction des nucleus. Gallia prehistoire 52, 1e32.

Locht, J.-L., Coutard, S., Antoine, P., Sellier, N., Ducrocq, T., Paris, C., Guerlin, O., Kiefer, D., Defaux, F., Deschodt, L., 2013. Donnees inedites sur le Quaternaire et le Paleolithique du nord de la France. Revue Archeologique de Picardie 3, 5e70.

Lohest, M., Fraipont, C., 1912. Compte rendu de l'excursion de la Societe geologique de Belgique, a Ste-Walburge (Liege). Annales de la Societe geologique de Belgique 39, B181eB198.

Locht, J.-L., Herisson, D., Goval, E., Cliquet, D., Huet, B., Coutard, S., Antoine, P., Feray, P., 2016. Timescales, space and culture during the Middle Palaeolithic in northwestern France. Quaternary International 411PA, 129e148.

Louguet, S., 2004. Les tres grands herbivores (elephantides et rhinocerotides) au Paleolithique moyen en Europe du Nord-Ouest. Universite des Sciences et Technologies de Lille 1, Villeneuve-d'Ascq.

Louguet, S., 2005. Les megaherbivores (Elephantides et Rhinocerotides) au Paleolithique moyen en Europe du Nord-Ouest. Paleoecologie, taphonomie et aspects palethnographiques. British Archaeological Reports. (Oxford).

Louguet, S., 2006. Determining the age of death of Proboscids and Rhinocerotids from dental attrition. Recent advances in ageing and sexing animal bones. In: Proceedings of the 9th Conference of the International Council of Archaeozoology.

Marcy, J.-L., 1984. Aperçu sur les sols d'habitat du gisement paleolithique moyen de Biache-Saint-Vaast (Pas-de-Calais). Cahiers de Geographie physique. Travaux du Laboratoire de Geomorphologie et d'Etude du Quaternaire 5, 59e76.

Marcy, J.-L., 1985. Les sols d'habitat du gisement paleolithique moyen de BiacheSaint-Vaast (Pas-de-Calais). Maitrise de l'Universite des Sciences et Technologies de Lille, Villeneuve-d'Ascq.

Marcy, J.-L., 1986. Les series lithiques du gisement mousterien de Biache-SaintVaast (Pas-de-Calais): variations morphometriques et technologiques. Universite des Sciences et Technologies de Lille, Villeneuve-d'Ascq.

Marcy, J.L., 1988. Le debitage de cinq des series lithiques de Biache-Saint-Vaast (Pasde-Calais). Revue archeologique de Picardie 125e132.

Marcy, J.-L., 1989. L'outillage sur eclat du gisement acheuleen de la vallee du Muid a Gouzeaucourt (Nord): Premiers resultats. In: Tuffreau, A. (Ed.), Pa leolithique et Mesolithique Du Nord de La France. Nouvelles Recherches, Villeneuve-d'Ascq, pp. 31e41.

Marcy, J.-L., Tuffreau, A., 1988a. Le niveau D1. In: Tuffreau, A., Somme, J. (Eds.), Le Gisement Paleolithique Moyen de Biache-Saint-Vaast (Pas-de-Calais). Stratigraphie, Environnement, Etudes Archeologiques (1ere Partie). Societe Prehistorique Française, pp. 263e289.

Marcy, J.-L., Tuffreau, A., 1988b. Le niveau D. In: Tuffreau, A., Somme, J. (Eds.), Le Gisement Paleolithique Moyen de Biache-Saint-Vaast (Pas-de-Calais). Stratigraphie, Environnement, Etudes Archeologiques (1ere Partie). Societe Prehistorique Française, pp. 291e300.

Marx, O., 2001. Fracturation des os longs d'Ursides: etude du gisement paleolithique moyen ancien de Biache-Saint-Vaast (Pas-de-Calais, France). Universite Lille 1, Villeneuve-d'Ascq.

Meijer, T., Cleveringa, P., 2009. Aminostratigraphy of Middle and Late Pleistocene deposits in The Netherlands and the southern part of the North Sea Basin. Global and Planetary Change 68, 326e345.

Meijs, E., 2002. Loess stratigraphy in Dutch and Belgian Limburg. Eiszeitalter und Gegenwart 51, 114e130.

Meijs, M., 2011. The Veldwezelt Site (Province of Limburg, Belgium): Environmental and Stratigraphical Interpretations, pp. 73e94.

Meijs, E.P.M., Groenendijk, A.J., 1999. Midden-Paleolithische vondst in een nieuwe geologische context. Archeologie in Limburg 79, 1e6.

Meijs, E.P.M., Van Peer, P., de Warrimont, J.P.L.M.N., 2012. Geomorphologic context and proposed chronostratigraphic position of Lower Palaeolithic artefacts from the Op de Schans Pit near Kesselt (Belgium) to the West of Maastricht. Netherlands Journal of Geosciences e Geologie en Mijnbouw 91, 137e157.

Michel, J., 1978. Les industries paleolithique de la Carriere Helin a Spiennes. Helinium 18, 35e67.

Michel, A., 1982. Rapport sur la fouille effectuee sur le gisement de Saint-MartinOsmonville “la Salle” (Seine-Maritime), 137 p.

Michel, J., 1983. Le Paleolithique inferieur en Belgique. Bilan des decouvertes. In: Cahen, D. (Ed.), Decouvertes Recentes de Paleolithique Inferieur et Moyen En Europe Du Nord-Ouest. Colloque Organise Par Le Groupe de Contact Prehistoire-Prehistoire et La Societe de Recherche Prehistorique En Hainaut, Mons, 28e29 Mars 1981? Leuven, pp. 43e48.

Michel, D., Coutard, J.P., Ozouf, J.-C., Helluin, M., Pellerin, J., 1982. Le gisement prehistorique de Port-Pignot a Fermanville (Manche). Gallia Prehistoire 25, 1e77.

Michel, D., 1994. La Roche-Geletan. Gisement structure du Paleolithique inferieur (Saint-Germain-des-Vaux, Manche). Evreux, 93 p.

Michel, V., Shen, G., Valensi, P., de Lumley, H., 2009. ESR dating of dental enamel from Middle Palaeolithic levels at Lazaret Cave, France. Quaternary Geochronology 4 (3), 233e240.

Michel, V., Yokoyama, Y., Falgueres, C., Ivanovich, M., 2000. Problems encountered in the U-Th dating of fossil red deer jaws (bone, dentine, enamel) from Lazaret Cave: a comparative study with early chronological data. Journal of Archaeological Science 27 (4), 327e340.

Michel, V., Shen, G., Shen, C.C., Fornari, M., Verati, C., Gallet, S., Sabatier, D., 2011. Les derniers Homo heidelbergensis et leurs descendants les neandertaliens: Datation des sites d’Orgnac 3, du Lazaret et de Zafarraya. Comptes Rendus Palevol 10 (7), 577e587.

Moir, J.R., Hopwood, A.T., 1939. Excavations at Brundon, Suffolk (1935e37). Proceedings of the Prehistoric Society (New Series) 5, 1e32. http://dx.doi.org/10.1017/S0079497X00020661.

Moncel, M.-H., 1989. L'Industrie lithique du site d'Orgnac 3 (Ardeche, France): contribution a la connaissance des industries du Pleistocene moyen et de leur evolution dans le temps. Museum National d'Histoire Naturelle, Inst. de paleontol. hum.

Moncel, M.-H., 1999. Les assemblages lithiques du site pleistocene moyen d'Orgnac 3 (Ardeche, Vallee du Rho^ne, France). Contribution a la connaissance du Paleolithique moyen ancien et du comportement technique differentiel des Hommes du Paleolithique inferieur et du Paleolith. ERAUL, 86. ed.

Moncel, M.-H., 2003. L'exploration de l'espace et la mobilite des groupes humains au travers des assemblages lithiques a la fin du pleistocene moyen et au debut du pleistocene superieur: la moyenne vallee du Rho^ne entre Dro^me et Ardeche, France. BAR. ed.

Moncel, M.-H. dir., 2008. Payre. Des occupations humaines de la moyenne vallee du Rho^ne de la fin du Pleistocene moyen et du debut du Pleistocene superieur. Memoire de la. Societe Prehistorique Française.

Moncel, M.-H., Condemi, S., 2007. The human remains of the site of Payre (SE France, MIS 7-5). remarks on stratigraphic position and interest. Anthropologie 45, 19.

Moncel, M.-H., Moigne, A.-M., Combier, J., 2005. Pre-neandertal behaviour during isotopic stage 9 and the beginning of stage 8. New data concerning fauna and lithics in the different occupation Levals of Orgnac 3 (Ardeche, south-east France): occupation types. Journal of Archaeological Science 32, 1283e1301.

Moncel, M.-H., Moigne, A.-M., Sam, Y., Combier, J., 2011. The emergence of neanderthal technical behavior: new evidence from Orgnac 3 (Level 1, MIS 8), Southeastern France. Current Anthropology 52, 37e75.

Moncel, M.-H., Moigne, A.-M., Combier, J., 2012. Towards the Middle Paleolithic in western Europe: the case of Orgnac 3 (South-Eastern France). Journal of Human Evolution 63, 653e666.

Monnier, J.-L., 1976. Le gisement paleolithique ancien du port de Piegu, Pleneuf-ValAndre (Co^tes-du-Nord). Bulletin de la Societe prehistorique française. Comptes rendus des seances mensuelles 73, 179e189.
Monnier, J.-L., 1980. Le Paleolithique de la Bretagne dans son cadre geologique: travaux du laboratoire d'Anthropologie-Prehistoire-Protohistoire et Quaternaire armoricans. Universite de Rennes.
Monnier, J.L., 1982. Le Paleolithique inf erieur et moyen en Bretagne. Habitats et economie des mati eres premi eres. Bulletin de l'Association française pour l'etude du quaternaire 19, 93 e104. http://dx.doi.org/10.3406/quate.1982.1425.
Monnier, J.-L., 1985. Donnees nouvelles sur le gisement paleolithique moyen de Piegu (Pleneuf-Val-Andre, Co^tes-du-Nord). Revue archeologique de l'Ouest 2, 7e21.
Monnier, J.L., 1988. Chronostratigraphie et ecologie des industries paleolithiques de la Bretagne. Revue archeologique de Picardie 1, 75e80.
Monnier, G.F., 2006. The Lower/Middle Paleolithic Periodization in western Europe: an evaluation. Current Anthropology. http://dx.doi.org/10.1086/506280.
Monnier, J.L., Van Vliet-Lanoe, B., Bigot, B., 1986. Nantois: loess saaliens, pedocomplexe eemien et cycle weichsehen. In: Lautridou, J.P., Keen, D., Monnier, J.L. (Eds.), Symp. Com. INQUA Loess et Commission UGI Periglaciaire, Normandie-Jersey-Bretagne, 20e27 août 1986, Loess et autres depo^ts periglaciaires pleistocenes de l'Europe du Nord-Ouest; relations avec les formations marines. Centre de Geomorphologie du CNRS, Caen, pp. 168e178.
Monnier, J.-L., Huet, B., Laforge, M., 2011. Application of sedimentological analysis to correlation of eroded layers under beaches with local and regional Pleistocene stratigraphy: a contribution to geological dating of Palaeolithic sites, northern coast of Brittany, France. Quaternary International 231, 78e94.
Nicoud, E., 2011. Le pheno mene acheuleen en Europe occidentale: Approche chronologique, technologie lithique et implications culturelles.
Niekus, M.J.L.Th., Stapert, D., 2005. Het Midden-Paleolithicum in Noord-Nederland. In: Deeben, J., Drenth, E., van Oorsouw, M.-F., Verhart, L. (Eds.), De Steentijd van Nederland (Archeologie 11/12). Zonder plaats, pp. 91e118.
Otte, M., 1979. Documents paleolithiques recemment donnees au Musee Curtius par Monsieur J. Thisse-Derouette. Bulletin de l'Institut archeologique liegeois XCI 159e192.
Otte, M., 1983. Le Paleolithique de Belgique. Essai de synthese. L'Anthropologie 87, 291e321.
Otte, M., Boe€da, E., Haesaerts, P., 1990. Rocourt: industrie laminaire archaïque. Helinium XXIX, 3e13.
Parfitt, S., 1998. The interglacial mammalian fauna from Barnham. In: Ashton, N., Lewis, S., Parfitt, S. (Eds.), Excavations at the Lower Palaeolithic Site at East Farm, Barnham, Suffolk 1989-94. British Museum Press, pp. 111e147.
Parfitt, K., Halliwell, G., 1996. More palaeolithic discoveries in East Kent. Kent Archaeological Review 58.
Pasda, C., 1994. Murg-Kalvarienberg: Eine mittelpala€olitische Fundstelle am Hochrhein. Arch€aologisches Korrespondenzblatt 24, 117e135.
Pasda, C., 1996. Rohknolle, Vollkern oder Abschlag? Strategien der Rohmaterialnutzung im Mittelpala€olithikum von Zwochau (Leipziger Tieflandsbucht). Archa€ologisches Korrespondenzblatt 26, 1e12.
Penkman, K.E.H., Preece, R.C., Keen, D.H., Maddy, D., Schreve, D.C., Collins, M.J., 2007. Testing the aminostratigraphy of fluvial archives: the evidence from intra-crystalline proteins within freshwater shells. Quaternary Science Reviews 26, 2958e2969. http://dx.doi.org/10.1016/j.quascirev.2007.06.034.
Penkman, K.E.H., Preece, R.C., Bridgland, D.R., Keen, D.H., Meijer, T., Parfitt, S.A., White, T.S., Collins, M.J., 2011. A chronological framework for the British Quaternary based on Bithynia opercula. Nature 476, 446e449.
Penkman, K.E.H., Preece, R.C., Bridgland, D.R., Keen, D.H., Meijer, T., Parfitt, S.A., White, T.S., Collins, M.J., 2013. An aminostratigraphy for the British Quaternary based on Bithynia opercula. Quaternary Science Reviews 61, 111e134. http://dx.doi.org/10.1016/j.quascirev.2012.10.046.
Peresani, M., 1998. La variabilite du debitage discoïde dans la grotte de Fumane (Italie du Nord). Paleo 10, 123e146.
Peresani, M., 2003. Discoid Lithic Technology e Advances and Implications. BAR International Series 1120.
Picin, A., Peresani, M., Falgueres, C., Gruppioni, G., Bahain, J.J., 2013. San Bernardino Cave (Italy) and the Appearance of Levallois Technology in Europe: Results of a Radiometric and Technological Reassessment. PLoS One 8, 4e11. http://dx.doi.org/10.1371/journal.pone.0076182.
Piningre, J.F., 1978. Quelques caracteristiques du debitage du site pa leolithique de Biache- Saint-Vaast (Pas-de-Calais). Bulletin de l'Association française pour l'etude du Quaternaire 15, 56e59.
Pirson, S., Di Modica, K., 2011. Position chronostratigraphique des productions lithiques du Paleolithique ancien en Belgique: un etat de la question. In: Toussaint, M., Di Modica, K., Pirson, S. (Eds.), Le Paleolithique Moyen En Belgique. Melanges Marguerite Ulrix-Closset. ERAUL, Liege, pp. 105e148.
Pirson, S., Haesaerts, P., Di Modica, K., 2009. Cadre chronostratigraphique des principaux gisements du Paleolithique moyen du bassin de la Haine: un etat de la question. In: Di Modica, K., Jungels, C. (Eds.), Paleolithique Moyen En Wallonie. La Collection Louis Eloy. Service du Patrimoine culturel de la Communaute française, Bruxelles, pp. 58e77.
Pirson, S., Drailly, C., Toussaint, M., Pirson, S., Toussaint, M., Drailly, C., Toussaint, M., 2011. La grotte Walou a Trooz (Belgique). Fouilles de 1996 a 2004. In: Les Sciences de La Terre. Etudes et Documents e Archeologie, vol. 1. Institut du Patrimoine Wallon, Namur, p. 208.
Preece, R.C., 1995. Island Britain: a Quaternary perspective. Geological Society, London, Special Publications. http://dx.doi.org/10.1144/GSL.SP.1995.096.01.01.
Raynal, J.-P., 2007. Sainte-Anne I, Sinzelles, Polignac, Haute-Loire. Le Paleolithique moyen de l'unite J1. Archeo-Logis/CDERAD.
Raynal, J.-P., Moncel, M.-H., Fernandes, P., Bindon, P., Daujeard, C., Fiore, I., Santagata, C., Lecorre-Le Beux, M., Guadelli, J.-L., Lepape, J.-M., 2013. Land-use strategies, related tool-Kits and social Organization of Lower and Middle Palaeolithic groups in the south-east of the Massif Central, France. Quart€ar 60, 29e59.
Revillion, S., 1994. Les industries laminaires du Paleolithique moyen en Europe septentrionale. L'exemple des gisements de Saint-Germain-des-Vaux/PortRacine (Manche), de Seclin (Nord) et de Riencourt-les-Bapaume (Pas-de-Calais). Lille.
Richter, J., 2011. When did the Middle Paleolithic begin? In: Conard, N.J., Richter, J. (Eds.), Neanderthal Lifeways, Subsistence and Technology. One Hundred Fifty Years of Neanderthal Study. Springer, pp. 7e14.
Rigaud, J.-P. dir., 1988. La grotte Vaufrey: paleoenvironnement, chronologie, activites humaines. Memoires de la Societe Prehistorique Française, 19.
Rocca, R., 2005. Approche des comportements territoriaux des hommes fossiles, nouveau critere de definition de l'Acheuleen dans le nord ouest de la France? Etude appliq uee a deux series lithiques issues des niveaux superieurs des sites de Soucy 5 et Soucy 3 dans l'Yonne. Universite Paris X, Nanterre.
Roebroeks, W., 1981. Zur geochronologische Einordnung der Mittelpala€olithischen Funde von Lüttich-Sainte Walburge (Belgien). Archa€ologisches Korrespondenzblatt 11, 285e287.
Roebroeks, W., 1982. Vondsten uit de groeve Belvedere te Maastricht. Archeologie in Limburg 15, 12e14.
Roebroeks, W., 1988. From Find Scatters to Early Hominid Behaviour. A Study of Middle Palaeolithic Riverside Settlements at Maastricht-Belvedere (The Netherlands). Analecta Praehistorica Leidensia, 21. (Leiden).
Roebroeks, W., Conard, N.J., van Kolfschoten, T., 1992. Dense forests, cold steppes, and the Palaeolithic settlement of northern Europe. Current Anthropology. http://dx.doi.org/10.1086/204113.
Roebroeks, W., Sier, M.J., Nielsen, T.K., De Loecker, D., Pares, J.M., Arps, C.E.S., Mucher, H.J., 2012. Use of red ochre by early Neandertals. Proceedings of the National Academy of Sciences. http://dx.doi.org/10.1073/pnas.1112261109.
Ronen, A. (Ed.), 1982. The Transition from Lower to Middle Palaeolithic and the Origin of Modern Man. British Archaeological Reports S151, Oxford.
Rosendahl, W., Wiegand, B., Kaulich, B., Reisch, L., 2006. Zur Altersstellung der mittelpala€olithischen Ho€hlenfundstelle Hunas, Ldkr. Nürnberger Land: Ergebnisse und interpretationen alter und neuer Sinterdatierungen. Germania 84, 1e17.
Rots, V., 2013. Insights into early Middle Palaeolithic tool use and hafting in Western Europe. The functional analysis of level IIa of the early Middle Palaeolithic site of Biache-Saint-Vaast (France). Journal of Archaeological Science 40, 497e506. http://dx.doi.org/10.1016/j.jas.2012.06.042.
Rougier, H., 1999. Les dents superieures de Biache-Saint-Vaast 1 (Biache-SaintVaast, Pas-de-Calais, France). Etude metrique et morphologique. Universite Bordeaux 1, Bordeaux.
Rougier, H., 2003. Etude descriptive et comparative de Biache-Saint-Vaast 1 (Biache-Saint-Vaast, Pas-de-Calais, France). These de doctorat. Universite Bordeaux 1, Bordeaux.
Ryssaert, C., 2004. Mesvin IV opnieuw bekeken. Het technologisch onderzoek van een vroege Mousteriaan site. Notae Praehistoricae 24, 9e15.
Ryssaert, C., 2005. The use of bipolar/anvil technique at the Middle Paleolithic site of Mesvin IV. Notae Praehistoricae 25, 17e24.
Ryssaert, C., 2006a. Some new insights in an old collection: lithic technology at Mesvin IV. Notae Praehistoricae 26, 91e99.
Ryssaert, C., 2006b. Lithische technologie te Mesvin IV: selectiecriteria voor geretoucheerde werktuigen en hun relatie met Levalloiseindproducten. Anthropologica et Praehistoria 117, 13e34.
Rigaud, J.-P., Texier, J.-P., 1981. A propos des particularites techniques et typologiques du gisement des Tares, commune de Sourzac (Dordogne). Bulletin de la Societe prehistorique française 78, 109e117.
Santagata, C., 2012. L'utilisation de roches autres que le silex au Paleolithique ancien et moyen: choix economiques, techniques et fonctionnels sur la base de l'etude des gisements de Sainte-Anne 1 (Haute-Loire, France)(MIS 5 et 6) et Notarchirico (Basilicata, Italie)(MIS 14. Bordeaux 1.
Santonja, M., Perez-Gonz alez, A., Panera, J., Rubio-Jara, S., Mendez-Quintas, E., 2015. The coexistence of Acheulean and Ancient Middle Palaeolithic technocomplexes in the Middle Pleistocene of the Iberian Peninsula. Quaternary International. http://dx.doi.org/10.1016/j.quaint.2015.04.056.
Scha€fer, J., 1990. Der altsteinzeitliche Fundplatz auf dem Vulkan SchweinskopfKarmelenberg. Ko€ln.
Scha€fer, D., 1993. Grundzüge der technologischen Entwicklung und Klassifikation vor-jungpala€olithischer Steinartefakte in Mitteleuropa. Bericht der Ro€mischGermanischen Kommission 74, 49e193.
Scha€fer, J., Laurat, T., K, J., 2003. Bericht zu den Ausgrabungen an dem altsteinzeitlichen Fundplatz Markkleeberg 1999-2001. Arbeits- und Forschungsberichte zur sa€chsischen Bodendenkmalpflege 45, pp. 13e47.
Schirmer, W., 2002. Lo€sse und Bo€den in Rheindahlen. GeoArchaeo ed. Lit Verlag, Münster.
Schmitz, R.W., Thissen, J., 1998. Vorbericht über die Grabungen 1995-1997 in der mittelpala€olithischen B1-Fundschicht der Ziegeleigrube Dreesen in Rheindahlen. Arch€aologisches Korrespondenzblatt 28, 483e498.
Schreve, D.C., 1997. Mammalian Biostratigraphy of the Later Middle Pleistocene in Britain (Unpublished Ph.D. thesis). University of London.

Schreve, D.C., 2001a. Mammalian evidence from Middle Pleistocene fluvial sequences for complex environmental change at the oxygen isotope substage level. Quaternary International 79, 65e74. http://dx.doi.org/10.1016/S1040-6182(00)00123-3.

Schreve, D.C., 2001b. Differentiation of the British late Middle Pleistocene interglacials: the evidence from mammalian biostratigraphy. Quaternary Science Reviews 20, 1693e1705.

Schreve, D.C., Bridgland, D.R., Allen, P., Blackford, J.J., Gleed-Owen, C.P., Griffiths, H.I., Keen, D.H., White, M.J., 2002. Sedimentology, palaeontology and archaeology of late Middle Pleistocene River Thames terrace deposits at Purfleet, Essex, UK. Quaternary Science Reviews 21, 1423e1464. http://dx.doi.org/10.1016/S02773791(01)00100-7.

Schreve, D.C., Harding, P., White, M.J., Bridgland, D.R., Allen, P., Clayton, F., Keen, D.H., Penkman, K.E.H., 2006. A Levallois knapping site at West Thurrock, Lower Thames, UK: its Quaternary context, environment and age. In: Proceedings of the Prehistoric Society. Cambridge Univ Press, pp. 21e52.

Schüler, T., 2004. ESR dating of a new palaeolithic find layer of the travertine site of Weimar-Ehringsdorf (Central Germany). In: 18th International Senckenberg Conference, Weimar, pp. 233e235.

Schvoerer, M., Rouanet, J.F., Navailles, H., Debenath, A., 1977. Datation absolue par thermoluminescence de restes humains antewürmiens de l'abri Suard, a la Chaise-de-Vouthon (Charente). CR Acad. Sc. Paris 284, 1979e1982.

Schwarcz, H.P., Debenath, A., 1979. Datation absolue des restes humains de la Chaise-de-Vouthon (Charente) au moyen du desequilibre des series d'uranium. Comptes Rendus de l'Academie des Sciences 288, 1155e1157. Paris.

Scott, B., 2006. The Early Middle Palaeolithic of Britain Origins, Technology and Landscape. University of Durham.

Scott, B., 2010. The investigation of Baker's Hole, Northfleet, Kent, 1909e1914; the impact of collection history upon the interpretation of archaeological data. Proceedings of the Geologists' Association 121, 77e82. http://dx.doi.org/ 10.1016/j.pgeola.2010.02.006.

Scott, B., 2011. In: Becoming Neanderthals: the Earlier British Middle Palaeolithic (Oxbow. ed. Oxford).

Scott, B., Ashton, N., 2011. The Early Middle Palaeolithic: the European context. In: Ashton, N., Lewis, S.G., Stringer, C. (Eds.), The Ancient Human Occupation of Britain, pp. 91e112.

Scott, B., Bates, M., Bates, R., Conneller, C., Pope, M., Shaw, A., Smith, G., 2014. A new view from La Cotte de St Brelade, Jersey. Antiquity 88, 13e29.

Sellier, N., 2002. Clairy-Saulchoix - A.29 Le Champ Mugotte - Au Chemin de Pissy. In: Bilan Scientifique de La Region Picardie, Annee 2002. Service Regional de l'Archeologie de Picardie, pp. 102e103.

Serangeli, J., Conard, N.J., 2015. The behavioral and cultural stratigraphic contexts of the lithic assemblages from Schoningen. Journal of Human Evolution.€ http://dx.doi.org/10.1016/j.jhevol.2015.07.004.

Serangeli, J., Bo€hner, U., Hassmann, H., Conard, N., 2012. Die pleistoza€nen Fundstellen in Scho€ningeneeine Einführung. In: Die Chronologische Einordnung Der Pal€aolithischen Fundstellen von Scho€ningen, Ro€misch-Germanisches Zentralmuseum, Mainz, pp. 1e22.

Shen, G., 1985. Datation des planchers stalagmitiques de sites acheuleens en Europe par les methodes des desequilibres des familles de l'Uranium et contribution methodologique (PhD dissertation). Universite de Paris VI, 162 p.

Sitlivy, V., 1996. La technologie de type hermitage: Paleolithique moyen ancien. Prehistoire Europeenne 9, 63e116.

Smith, R.A., 1911. XXIII.dA Palaeolithic industry at Northfleet, Kent. Archaeologia (Second Series) 62, 515e532.

Somme, J., Tuffreau, A., 1976. Le gisement paleolithique ancien de Beaumetz-les Loges. In: Verron, G. (Ed.), Livret-Guide de L'excursion A10: Nord-Ouest de La France (bassin de La Seine, Bassin de La Somme et Nord). Nice, pp. 195e199.

Soriano, S., 2000. Outillage bifacial et outillage sur eclat au Paleolithique ancien et moyen: coexistence et interaction. Universite Paris X Nanterre, Paris.

Soriano, S., 2001. Statut fonctionnel de l'outillage bifacial dans les industries du Paleolithique moyen: propositions methodologiques. In: Cliquet, D. (Ed.), Les Industries A Outils Bifaciaux Du Pa leolithique Moyen d'Europe Occidentale. Actes de La Table-Ronde Internationale Organisee A Caen (Basse-Normandie France) e 14 et 15 Octobre 1999. Universite de Liege, Liege, pp. 77e83.

Spurrell, F.C.J., 1880a. On the discovery of the place where Palaeolithic implements were made at Crayford. Quarterly Journal of the Geological Society 36, 544e548.

Spurrell, F.C.J., 1880b. On implements and chips from the floor of a Palaeolithic workshop. Archaeological Journal 37, 294e299.

Stapert, D., 1981. Middle Palaeolithic finds from the Wijchense Meer (Province of Gelderland) and several other finds from Pleistocene fluviatile deposits in the surrounding region. Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek 31.

Stapert, D., 1987. A progress report on the Rhenen industry (Central Netherlands) and its stratigraphical context. Palaeohistoria 29, 219e243.

Stapert, D., 1991. Archaeological research in the Fransche Kamp pit near Wageningen (central Netherlands). Mededelingen e Rijks Geologische Dienst 46, 71e88.

Steguweit, L., 1998. Neue Untersuchungen am mittelpleistoza€nen Flintinventar von Lübbow, Ldkr. Lüchow-Dannenberg. Die Kunde, pp. 1e40.

Stremme, H.E., 1985. Altersbestimmung und Pala€obo€den in der Quarta€rstratigraphie [Determination de l'age et paleosols dans la stratigraphie quaternaire.]. Bulletin de l'Association Française pour l'Etude du Quaternaire 22, 159e166.

Sun, X., Mercier, N., Falgueres, C., Bahain, J.-J., Despriee, J., Bayle, G., Lu, H., 2010. Recuperated optically stimulated luminescence dating of middle-size quartz grains from the Palaeolithic site of Bonneval (Eure-et-Loir, France). Quaternary Geochronology 5, 342e347. http://dx.doi.org/10.1016/j.quageo.2009.05.004.

Szabo, B.J., Collins, D., 1975. Ages of fossil bones from British interglacial sites. Nature 254, 680e682.

Roche, E., 1981. Mesvin IV: Analyse palynologique. Notae Praehistoricae 1, 83.

Thieme, H., 2007. Die Scho€ninger Speere. Mensch und Jagd vor 400 000 Jahren. Stuttgart.

Thisse-Derouette, J., Destexhe-Jamotte, J., 1947. Decouverte d'un gisement mousterien a Otrange (Province de Limbourg). Bulletin de la Societe Royal Belge d'Anthropologie et de Prehistroire 58, 337.

Thisse-Derouette, J., Destexhe-Jamotte, J., 1949. Quelques precisions sur la decouverte du gisement paleolithique d'Otrange. Les Chercheurs de la Wallonie 14, 3e17.

Thissen, J., 2006. Die pal€aolithischen Freilandstationen von Rheindahlen im Lo€ss zwischen Maas und Niederrhein, Rheinische Ausgrabungen. Verlag von Zabern.

Thomsen, C.J., 1836. Ledetraad til nordisk oldkyndighed. Copenhagen (English editon 1848, A Guide to Northern Antiquities).

Toepfer, V., 1981. Das Acheuleen auf dem Boden der Deutschen Demokratischen Republik in Contributions to the Origin of Man and his Cultural Development, vol. II. Anthropologie Brno 19, 55e77.

Tizzard, L., Bicket, A.R., Benjamin, J., De Loeker, D., 2014. A Middle Palaeolithic site in the southern North Sea: investigating the archaeology and palaeogeography of Area 240. Journal of Quaternary Science 29, 698e710. http://dx.doi.org/10.1002/ jqs.2743.

Toms, P.S., Hosfield, R.T., Chambers, J.C., Green, C.P., Marshall, P., 2005. Optical Dating of the Broom Palaeolithic Sites, Devon and Dorset. English Heritage.

Tuffreau, A., 1971. Quelques aspects du Paleolithique ancien et moyen dans le Nord de la France (Nord e Pas-de-Calais). Bulletin de la societe de Prehistoire du Nord n 8, 99 p.

Tuffreau, A., 1974. Contribution a l'etude du Paleolithique ancien et moyen dans le nord de la France et le bassin oriental de la Somme. Universite Paris I, Paris.

Tuffreau, A., 1976. Les fouilles du gisement Acheuleen sup erieur des Osiers a Bapaume (Pas-de-Calais). Bulletin de la Societ e pr ehistorique française 73, 231e243. http://dx.doi.org/10.3406/bspf.1976.8443.

Tuffreau, A., 1979. Les debuts du Paleolithique moyen dans la France septentrionale. Bulletin de la Societ e prehistorique française 76, 140e142.

Tuffreau, A., 1983. Les industries lithiques a debitage laminaire du Paleolithique moyen de la France septentrionale. In: Decouvertes Recentes de Paleolithique Inferieuret Moyen En Europe Du Nord-Ouest. Colloque Organise Par Le Groupe de Contact Prehistoire-Prehistorie et La Societe de Recherche Prehistorique En Hainaut, Mons, 28-29 Mars 1981. Studia Praehistorica Belgica Leuven, pp. 135e141.

Tuffreau, A., 1986. Biache-Saint-Vaast et les industries mousteriennes du Pleistocene moyen recent dans la France septentrionale. In: Chronostratigraphie et facies culturels du Paleolithique inferieur et moyen dans l'Europe du Nord-Ouest, Actes du 22 Congres Prehistorique de France.

Tuffreau, A., 1987. Le Paleolithique inferieur et moyen du Nord de la France (Nord Pas-de-Calais, Picardie) dans son cadre stratigraphique. Universite des Science s et Techniques de Lille Flandre Artois, Lille.

Tuffreau, A., 1988a. Historique des fouilles effectuees a Biache-Saint-Vaast. In: Tuffreau, A., Somme, J. (Eds.), Le Gisement Paleolithique Moyen de BiacheSaint-Vaast (Pas-de-Calais). Stratigraphie, Environnement, Etudes Archeologiques (1ere Partie). Societe Prehistorique Française, pp. 15e24.

Tuffreau, A., 1988b. Les habitats du Paleolithique inferieur et moyen dans le Nord de la France (Nord,Pas-de-Calais, Somme). Revue archeologique de Picardie 91e104.

Tuffreau, A., 1989. Le gisement paleolithique moyen de Champvoisy (Marne). In: Tuffreau, A. (Ed.), Paleolithique et Mesolithique Du Nord de La France: Nouvelles Recherches. Villeneuve-d'Acsq, pp. 69e77.

Tuffreau, A., 1992. Middle Paleolithic settlement in northern France. In: Dibble, H.L., Mellars, N. (Eds.), The Middle Paleolithic: Adaptation, Behavior and Variability. Philadelphia, pp. 59e73.

Tuffreau, A., 1993. Riencourt-les-Bapaume (Pas-de-Calais). Un gisement du Paleolithique moyen. dAf.

Tuffreau, A., Bouchet, J.-P., 1985. Le gisement acheuleen de la Vallee du Muid a Gouzeaucourt (Nord). Bulletin de la Societe prehistorique française 82, 291e306.

Tuffreau, A., Fagnart, J.-P., 1986. Nouvelles recherches a la carriere Bultel-Tellier de Saint-Acheul (Amiens, Somme). Antiquites Nationales 18/19, 47e54.

Tuffreau, A., Marcy, J.-L., 1988. Le niveau II base. In: Tuffreau, A., Somme, J. (Eds.), Le Gisement Paleolithique Moyen de Biache-Saint-Vaast (Pas-de-Calais). Stratigraphie, Environnement, Etudes Archeologiques (1ere Partie). Societe Prehistorique Française, pp. 231e261.

Tuffreau, A., Zuate y Zuber, J., 1975. La terrasse fluviatile de Bagarre (Etaples, Pas-deCalais) et ses industries: note preliminaire. Bulletin de la Societe prehistorique française 72, 229e235.

Tuffreau, A., Munaut, A.V., Puissegur, J.J., Somme, J., 1981. Les basses terrasses dans les vallees du Nord de la France et de la Picardie: Stratigraphie et Paleolithique. Bulletin de la Societe prehistorique française 78, 291e305.

Tuffreau, A., Ameloot-Van der Heijden, N., Marcy, J.-L., 1989. La fin du courant acheuleen et les differentes industries de la phase ancienne du Paleolithique moyen du Nord de la France. In: Resume des communications du colloque "l'Acheuleen dans l'Ouest de l'Europe.".

Tuffreau, A., Antoine, P., Chase, P.G., Dibble, H.L., Ellwood, B.B., Kolfschoten, T. van, Lamotte, A., Laurent, M., Pherron, S.P., Moigne, Anne-Marie, McMunaut, A.V., 1995. Le gisement acheuleen de Cagny-l'Epinette (Somme). Bulletin de la Societe prehistorique française 169e192.

Tuffreau, A., Antoine, P., Marcy, J.-L., Segard, N., 2001. Les industries paleolithiques a nombreux bifaces du Mont de l'Evangile a Gentelles (Somme). In: Cliquet, D. (Ed.), Les

Industries Aoutils Bifaciaux Du Paleolithique Moyen d'Europe Occidentale. Actes de La Table-Ronde Internationale Organisee A Caen (Basse-Normandie e France) e 14 et 15 Octobre 1999. ERAUL, pp. 29e41.

Tuffreau, A., Lamotte, A., Goval, E., 2008. Les industries acheuleennes de la France septentrionale. Anthropologie 112, 104e139. http://dx.doi.org/10.1016/j.anthro.2008.01.003.

Turner, E., Boenick, W., Frechen, M., Van Kolfschoten, T., Schnepp, E., Sefkov, E., Steensma, A., 1997. Ariendorf. Quaternary deposits and Palaeolithic excavations in the Karl Schneider gravel pit. Jahrbuch des Ro€misch-Germanischen Zentralmuseums Mainz 44, 3e191.

Turq, A., 1988. Le Mousterien de type Quina du Roc de Marsal a Campagne (Dordogne). Document d'Archeologie Perigourdine (ADRAP) 3, 5e30.

Turq, A., 1992. Le Paleolithique inferieur et moyen entre les vallees de la Dordogne et du Lot. These de doctorat. Universite de Bordeaux I.

Turq, A., Brenet, M., Colonge, D., Jarry, M., Lelouvier, L.-A., O'Farrell, M., Jaubert, J., 2010. The first human occupations in southwestern France: a revised summary twenty years after the Abbeville/Saint Riquier colloquium. Quaternary International 223e224, 383e398. http://dx.doi.org/10.1016/j.quaint.2010.03.012.

Ulrix-Closset, M., 1975. Le Paleolithique moyen dans le bassin mosan en Belgique. Bibliotheque de la Faculte de Philosophie et Lettres de l'Universite de Liege: Publications exceptionnelles. Edition Universa, Liege-Sainte Walburge.

Ulrix-Closset, M., 1981. Le Paleolithqiue inferieur et moyen en Belgique. Etat de la question. In: Duvosquel, J. (Ed.), Compte-Rendu Du XLVe Congres de La Federation Des Cercles d'Archeologie et d'Histoire de Belgique e 1er Congres de l'Association Des Cercles Francophones d'Histoire et d'Archeologie de Belgique, Comines, 28-31 Août 1980. Veys, Tielt, pp. 181e196.

Valensi, P., Michel, V., El Guennouni, K., Liouville, M., 2013. New data on human behavior from a 160,000 year old Acheulean occupation level at Lazaret cave, south-east France: an archaeozoological approach. Quaternary International 316, 123e139. http://dx.doi.org/10.1016/j.quaint.2013.10.034.

Valladas, H., Mercier, N., Falgueres, C., Bahain, J., 1999. Contribution des m ethodes nucleaires a la chronologie des cultures paleolithiques entre 300 000 et 35 000 ans BP. Gallia prehistoire. http://dx.doi.org/10.3406/galip.1999.2163.

Valladas, H., Mercier, N., Ayliffe, L.K.K., Falgueres, C., Bahain, J.-J.J., Dolo, J.-M.M., Froget, L., Joron, J.-L.L., Masaoudi, H., Reyss, J.-L.L., Moncel, M.-H.H., 2008. Radiometric dates for the Middle Palaeolithic sequence of Payre (Ardeche, France). Quaternary Geochronology 3, 377e389. http://dx.doi.org/10.1016/ j.quageo.2008.01.001.

Vallin, L., 1991. Un site de boucherie probable dans le Pleistocene moyen de Tourville-la-Riviere (Seine-Maritime). In: Actes Du Symposium, 11-17 de La 11e R.S.T., Clermont-Ferrand (1986). Cahiers du Quaternaire, 16, pp. 241e260.

Van Asperen, E., 2008. The horses of Mesvin IV (Hainaut, B.). Notae Praehistoricae 28, 11e20.

Van Baelen, A., 2014. Kesselt-Op de Schans (Limburg, Belgium) and the Lower/ Middle Palaeolithic transition in Northwestern Europe. KU Leuven, Leuven.

Van Baelen, A., Ryssaert, C., 2011. The early Middle Palaeolithic of Belgium. In: Toussaint, M., Di Modica, K., Pirson, S. (Eds.), Le Paleolithique Moyen En Belgique. Melanges Marguerite Ulrix-Closset. ERAUL, Liege, pp. 197e212.

Van Baelen, A., Meijs, E., Van Peer, P., de Warrimont, J.P., De Bie, M., 2007. An early Middle Palaeolithic site at Kesselt-Op de Schans (Belgian Limburg). Preliminary results. Notae Praehistoricae 27, 19e26.

Van Baelen, A., Meijs, E., Van Peer, P., de Warrimont, J.P., De Bie, M., 2008. The early Middle Palaeolithic site of Kesselt-Op de Schans (Belgian Limburg). Excavation campaign 2008. Notae Praehistoricae 28, 5e9.

Van Baelen, A., Vroomans, J.-M., Van Peer, P., 2011. A diachronic perspective on the Palaeolithic occupations at Kesselt-Op de Schans. In: Toussaint, M., Di Modica, K., Pirson, S. (Eds.), Le Paleolithique Moyen En Belgique. Melanges Marguerite Ulrix-Closset. ERAUL, Liege, pp. 395e398.

Van Balen, R.T., 2006. Stuwwal ontsluiting A28-ecoduct, Amersfoort-Soesterberg. Grondboor & Hamer 2, 37e43.

Van Balen, R.T., Busschers, F.S., 2010. Human presence in the central Netherlands during early MIS 6 (~ 170-190 Ka): evidence from early Middle Palaeolithic artefacts in ice-pushed Rhine-Meuse sediments. Netherlands Journal of Geosciences 89, 77e83.

Van de Moortel, K., 2008. Een bijdrage tot het geochronologisch onderzoek met de luminescentiedateringsmethode van de middenpleistocene loessafzettingen te Vroenhoven (Belgisch Limburg). Universiteit Gent, Gent.

Vandenberghe, J., Roebroeks, W., Van Kolfschoten, T., 1993. MaastrichtBelvedere: stratigraphy, palaeoenvironment and archaeology of the Middle and Late Pleistocene deposits; Part II. Mededelingen Rijks Geologische Dienst 47, 1e91.

Van Den Haute, P., Frechen, M., Buylaert, J.P., Vandenberghe, D., De Corte, F., 2003. The Last Interglacial palaeosol in the Belgian loess belt: TL age record. Quaternary Science Reviews 985e990.

Van den Haute, P., Vancraeynest, L., De Corte, F., 1998. The Late Pleistocene loess deposits and palaeosols of eastern Belgium: new TL age determinations. Journal of Quaternary Science 13, 487e497.

Vandenberghe, J., Huijzer, B.S., Mücher, H., Laan, W., 1998. Short climatic oscillations in a western European loess sequence (Kesselt, Belgium). Journal of Quaternary Science 13, 471e485.

Van der Sloot, P., Pirson, S., Haesaerts, P., 2009. Campagne de fouilles 2009 sur le site paleolithique moyen de la Court Saint-Hubert a Liege (Belgique). Resultats preliminaires. Notae Praehistoricae 29, 23e35.

Van der Sloot, P., Haesaerts, P., Pirson, S., 2011. Les sites du Mont Saint-Martin (Liege). In: Toussaint, M., Di Modica, K., Pirson, S. (Eds.), Le Paleolithique Moyen En Belgique. Melanges Marguerite Ulrix-Closset. ERAUL, Liege, pp. 385e393.

Van Kolfschoten, T., Roebroeks, W., 1985. Maastricht-Belvedere, Stratigraphy, Palaeoenvironment and Archaeology of the Middle and Late Pleistocene deposits. Leiden University Press, Leiden.

van Kolfschoten, T., Roebroeks, W., Vandenberghe, J., 1993. The Middle and Late Pleistocene sedimentary and climate sequence at Maastricht-Belved ere: the type locality of the Belved ere interglacial. Mededelingen Rijks Geologische Dienst 47, 81e91.

Van Neer, W., 1981. Les mammiferes decouvert au site de Mesvin IV pendant les campagnes de 1979 et 1980. Notae Praehistoricae 84.

Van Neer, W., 1985. De zoogdierenfauna van Mesvin IV, een middenpaleolithische openluchtvindplaats nabij Mons, daterend van de voorlaatste ijstijd. Lutra 28, 124e125.

Van Neer, W., 1986. La faune saalienne du site Paleolithique moyen de Mesvin IV (Hainaut, Belgique) in Chronostratigraphie et facies culturels du Paleolithique inferieur et moyen dans l'Europe du Nord-Ouest. In: Tuffreau, A., Somme, J. (Eds.), Chronostratigraphie et Facies Culturels Du Paleolithique In ferieur e t Moyen Dans l'Europe Du Nord-Ouest. Actes Du Colloque International Organise A l'Universi te Des Sciences et Techniques de Lille Dans Le Cadre Du 22e Cong res Prehistorique de France, Lill. Societe Prehistorique Française e Association Française pour l'Etude du Quaternaire, Paris, pp. 103e111.

Van Peer, P., 1992. The Levallois Reduction Strategy. In: Monographs in World Aracaeology, vol. 13. Prehistory Press, Madison, Wisconsin.

Van Peer, P., 2001. A status report on the Lower and Middle Palaeolithic of Belgium. Anthropologica et Praehistorica 112, 11e20.

Vandermeersch, B., 1978. Le cr^ane pre-würmien de Biache-Saint-Vaast (Pas-deCalais). Les origines humaines et les epoques de l'intelligence. Colloque international (juin 1977).

Verpoorte, A., De Loecker, D., Niekus, M.J.L.T., Rensink, E., 2016. The Middle Palaeolithic of the Netherlands e contexts and perspectives. Quaternary International 411PA, 149e162.

Vieillevigne, E., Bourguignon, L., Ortega, I., Guibert, P., 2008. Analyse croisee des donnees chronologiques et des industries lithiques dans le grand sud-ouest de la France (OIS 10 a 3). PALEO. Revue d'archeologie prehistorique 20, 145e166.

Watteyne, D., 1985. Petit-Spiennes: industrie(s) a debitage levallois et para-levallois. Notae Praehistoricae 5, 95e104.

Weber, T., 1995. Multivariate methods for the classification of Lower and Middle Palaeolithic stone inventories. In: Ryan, N., Huggett, J. (Eds.), CAA 1994, pp. 105e112. BAR International Series.

Wenban-Smith, F.F., 1995. The Ebbsfleet Valley, Northfleet (Baker's hole). In: The Quaternary of the Lower Reaches of the Thames: Field Guide. Quaternary Research Association, Durham, pp. 147e164.

Wenban-Smith, F.F., 1996. The Palaeolithic Archaeology of Baker's Hole: a Case Study for Focus in Lithic Analysis. University of Southampton.

Wenban-Smith, F., 2004. Handaxe typology and Lower Palaeolithic cultural development: ficrons, cleavers and two giant handaxes from Cuxton. Lithics 25, 11e21.

White, M., Ashton, N., 2003. Lower Palaeolithic core technology and the origins of the Levallois method in north-western Europe. Current Anthropology 44, 598e609. http://dx.doi.org/10.1086/377653.

White, M.J., Scott, B., Ashton, N., 2006. The Early Middle Palaeolithic in Britain: archaeology, settlement history and human behaviour. Journal of Quaternary Science 21, 525e541. http://dx.doi.org/10.1002/jqs.1034.

White, M., 2000. The Clactonian question: on the interpretation of core and flake assemblages in the British Isles. Journal of World Prehistory 14, 1e63.

White, M., Ashton, N., Scott, B., 2011. The emergence, diversity and significance of Mode 3 (Prepared core) technologies. In: Ashton, N., Lewis, S.G., Stringer, C. (Eds.), Ancient Human Occupation of Britain. Journal of Quaternary Science, pp. 53e65. http://dx.doi.org/10.1016/B978-0-444-53597-9.00005-4.

Wisniewski, A., 2014. The beginnings and diversity of Levallois methods in the early Middle Palaeolithic of Central Europe. Quaternary International 326e327, 364e380. http://dx.doi.org/10.1016/j.quaint.2013.10.027.

Wymer, J., 1985. The Palaeolithic Sites of East Anglia. Geo Books.

Wymer, J., 1999. The Lower Palaeolithic Occupation of Britain. Trust for Wessex Archaeology Ltd. London (United Kingdom); Salisbury (United Kingdom); English Heritage.

Yokoyama, Y., 1989. Direct gamma-ray spectrometric dating of Anteneandertalian and Neandertalian human remains. In: Hominidae, Proceedings of the 2nd International Congress of Human Paleontology.

Zo€ller, L., Stremme, H., Wagner, G.A., 1988. Thermolumineszenz-datierung an lo€sspal€aoboden-sequenzen von nieder-, mittel- und oberrhein/bundesrepublik Deutschland. Chemical Geology: Isotope Geoscience 73, 39e62.

Yokoyama, Y., Bibron, R., Leger, C., Quaegebeur, J.P., 1985. ESR dating of paleolithic calcite: fundamental studies. Nuclear Tracks 10, 929e936.